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From the Editor, by Doug Hendricks, KI6DS

I hope that you enjoy this issue. A nice variety of construction articles this time, plus a couple of things to make you think. I encourage all of you to read Monty Northrup's Club Sandwich Project. I would hope that it becomes the seed to bear some QRP Club Project fruit.

I also hope that you can attend Pacificon this fall, on Oct. 19, 20, and 21 at the Sheraton Hilton in Concord, CA. Be sure to ask for the convention rates when you make your reservations. We have lots of fun things planned, and hope to see you there. 72, Doug, KI6DS

Building the Iowa QRP-10 with Extended Frequency Range

By Frank Roberts, VE3FAO

After reading the article by Mike Fitzgibbon, N0MF in the Fall 2000 issue of QRPp, I decided to build the IA QRP-10 transceiver. To start, I set out a list of additional objectives, including the following:

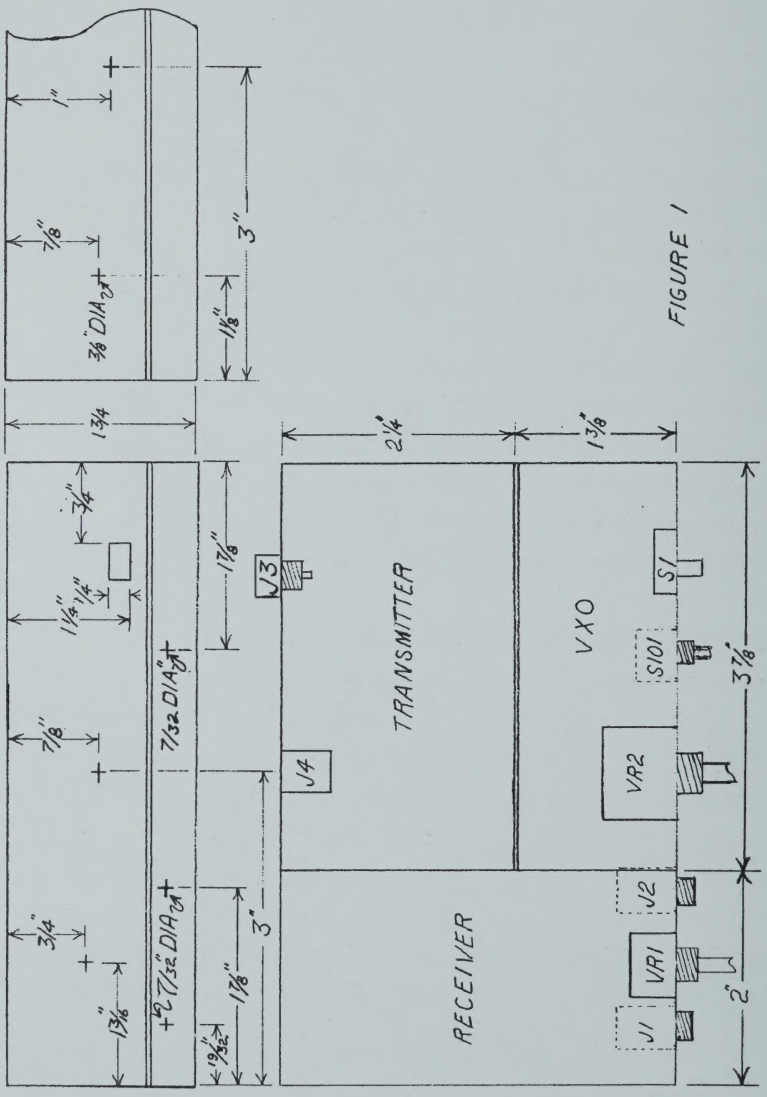
1. Construct it to fit a standard size, easily obtained enclosure
2. Make it fully operational out of the enclosure for tuning and troubleshooting
3. Minimize the number of exposed connecting wires
4. Have all circuitry on one circuit board including the TiCK keyer.
5. Expand the VXO to cover a 50 KHz range

Note: All references to components designated 00 to 99 are based on the article by Jim Kortge, K8IQY and the schematic in Spring 2000 issue of QRPp. Components in the 100 series are for the TiCK keyer outlined in the original article, and finally components in the 200 series are additions, mainly to expand the VXO coverage.

THE ENCLOSURE WAS BUILT FIRST

A standard Ten Tec model TG 26 enclosure (1 15/16 x 6 1/4 x 4 1/8) was selected. To ensure that the circuit board, with attached controls, could be inserted and extracted from the case easily, it was necessary to drill the mounting holes in the enclosure first. With reference to Figure 1, three 7/32" mounting holes were drilled for J1, J2, and S101 as marked. I then mounted the two jacks with the soldering tabs pointing down, but not shorting to the case. The pushbutton was oriented so that its upper surface was on the same plain as the upper surfaces of the jacks.

A blank double sided 3 5/8" x 5 7/8" circuit board was tested for proper fit making sure it sat evenly on the 3 mounted components and had about 1/8" clearance from the rear of the case. The rear clearance allows the board, with J1, J2 and S101 attached, to be angled into and out of the case. The circuit board was removed and glue spread on the top of



the jacks and pushbutton. Now the circuit board was pressed onto these components maintaining the clearance at the rear of the case and allowed to set. It was then possible to remove the mounting nuts from the front of the case and extract the circuit board from the case with the components securely attached to the under side.

A 3/8" hole was drilled in the centre of the front panel at a height to match the main tuning potentiometer I had selected allowing it to rest on the circuit board. With the circuit board in place and the potentiometer mounted with its casing just touching the circuit board, it was oriented so the soldering tabs were to the right and the lower ones about the thickness of the circuit board pads (nibbles) above the circuit board. I then glued the tuning control to the circuit board.

In a similar manner the hole for the band range switch was made and the switch glued to the top of the printed circuit board. I used a slide switch, but a DPDT toggle switch would work fine and could be oriented sideways so that the flat edge is glued to the circuit board.

The Gain control was mounted with its connections facing down and soldered to nibbles so I left this hole to be drilled later to match the final position of the control.

The power jack J4 was positioned on the top of the circuit board and in the centre even with rear edge. The lower mounting wing was filed off providing a flat surface so it could be glued directly to the circuit board.

Finally, the antenna jack, a BNC connector was held in place by its mounting lug soldered to the top of the circuit board and even with the rear edge and about 1 inch from the right side. The length of the ground lug determined the vertical position of the hole used to mount the BNC connector.

A CRADLE FOR THE IA QRP-10

I found it helpful to build a cradle from a piece of wood about 1 x 6 x 4 to support the circuit board when it is out of the cabinet both during construction and during alignment. Three

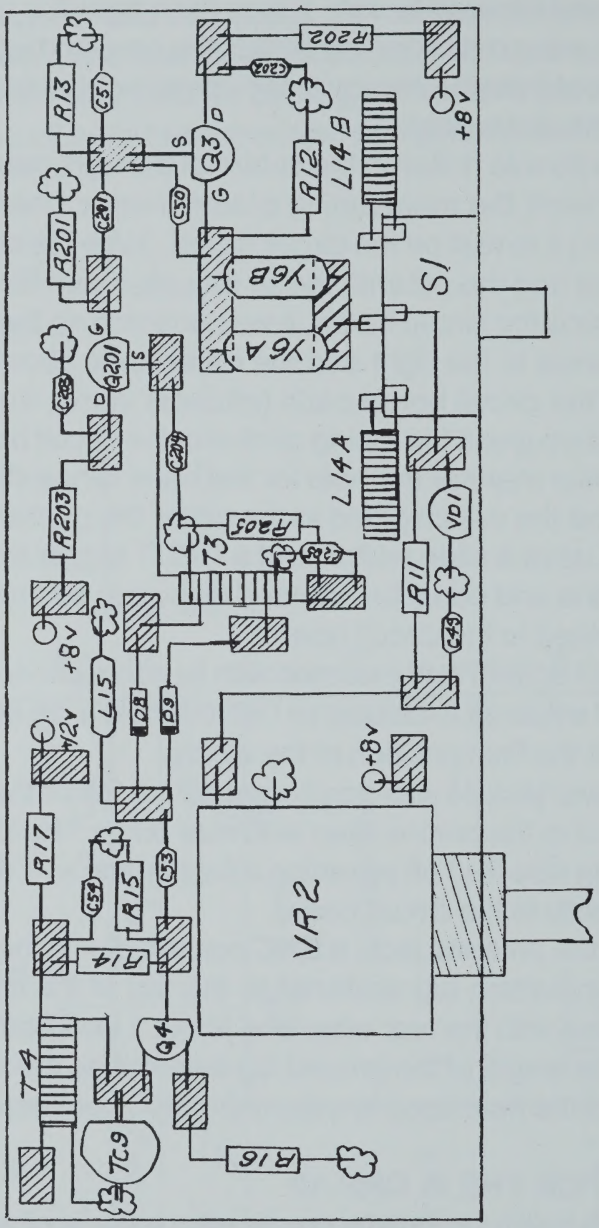

R202
C202
+8v
A13
C51
Q3
S
D
G
A12
L14B
A201
C201
C50
Y6B
Y6A
S1
C208
Q201
L14A
C209
R203
R205
73
C205
VD1
R11
C49
+8v
+12v
L15
VD8
VD9
+8v
R17
C54
R15
C53
VR2
R14
T4
Q4
TC9
R16

FIGURE 2

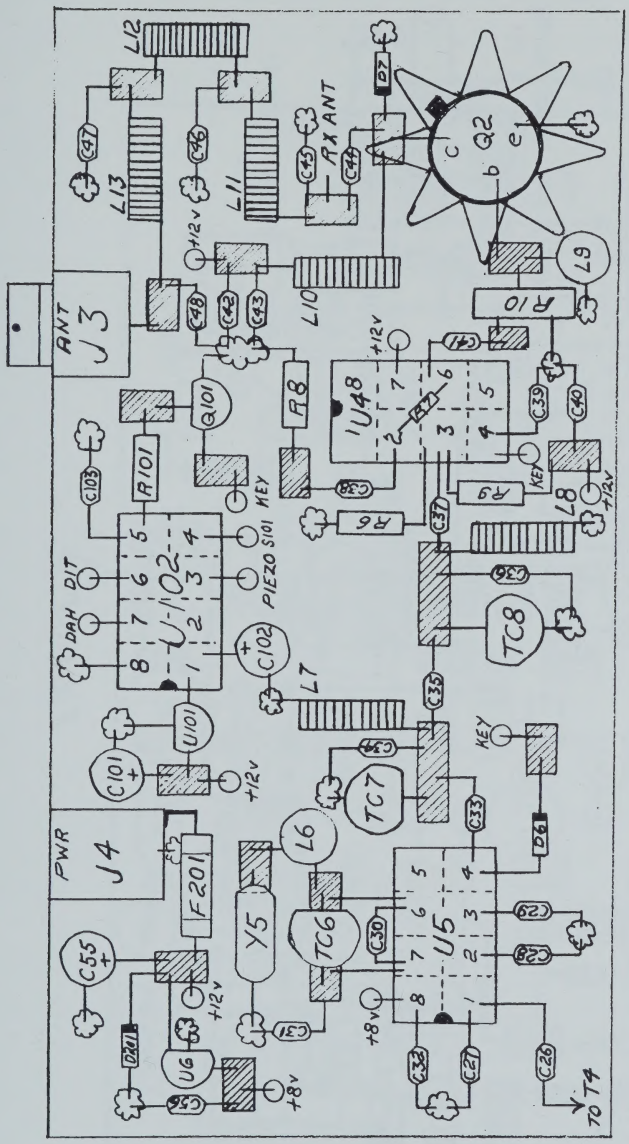

ANT
J3
L12
L13
L11
L10
C41
C46
C45
C44
ANT
+12V
C47
C48
C42
C43
Q101
R8
U48
R10
L9
Q2
C
b
e
C39
C40
R9
KEY
L8
C37
R6
C38
C103
R101
DAH
DIT
U102
PIEZO
S101
KEY
C102
L7
C101
U101
+12V
PWR
J4
F201
C55
+12V
Y5
L6
TC7
TC6
C30
U5
+8V
C31
+8V
C32
C27
C26
TO T4
KEY
C33
D61
C35
TC8
C36
C34
D7

FIGURE 3

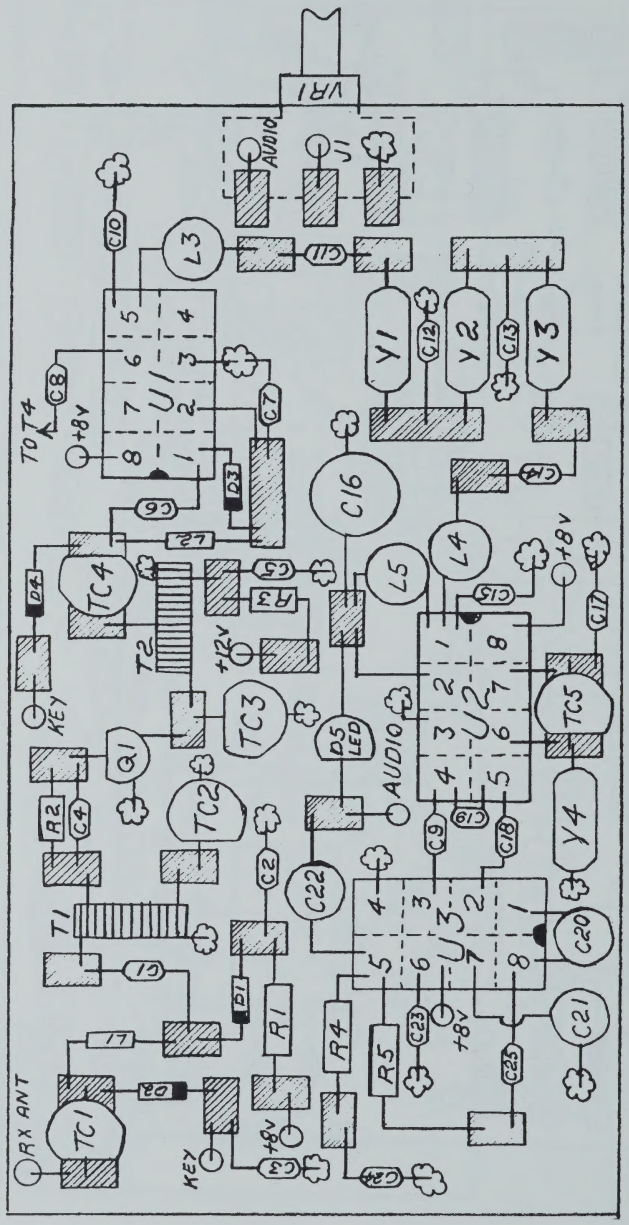

VR1
AUDIO
J1
L3
C10
C11
TO T4
C8
+8V
U1
C7
D3
C6
L2
C5
R3
TC4
D4
KEY
T2
+8V
TC3
Q1
D5 LED
AUDIO
R2
C4
TC2
T1
C2
C22
D1
R1
R4
R5
C23
+8V
C25
RX ANT
TC1
D2
L1
KEY
+8V
C3
C24
C16
L5
L4
C15
+8V
C17
U2
TC5
C9
C19
C18
Y4
U3
C20
C21
Y1
C12
Y2
C13
Y3
C14

FIGURE 4

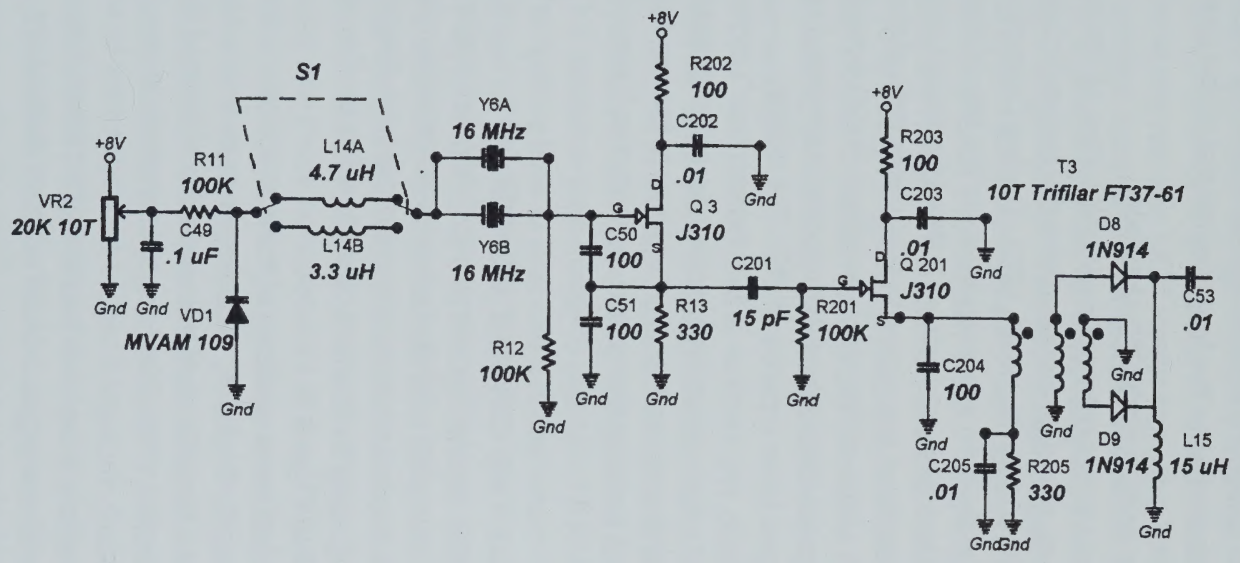


FIGURE 5

IOWA QRP 10 - VXO MOD BY VE3FAO

cut outs were made to accommodate the controls mounted on underside of the board. The cradle kept the PCB level and stable for gluing on the nibbles and met my objective to easily operate and tune the transceiver out of the case.

MINIMIZING THE EXPOSED WIRING

To reduce the number of exposed wires, all the controls and jacks were glued or soldered directly to the circuit board. J4 (DC in), VR1 (Gain Control), VR3 (Tuning Control) and S1 (Band Range Switch) are mounted on the top of the circuit board. J1 (Headphone Jack), J2 (Paddle Input) and S101 (Keyer Pushbutton) are glued to the under side of the circuit board. Both sides of the double-sided circuit board act as ground plains and had to be connected together. I used the braid salvaged from a piece of RG-174 cable.

In addition, my version of Manhattan has "Underground Utilities". All interconnecting power and signal cabling are run below the circuit board and brought up to the junction points through small holes in the board, as noted in figures 2, 3 and 4.

LAYING OUT THE CIRCUIT BOARD

The new layout combines the original three 2" x 4" boards into one 3 5/8 x 5 7/8 double sided circuit board. Each of the three sections has been oriented such that the VXO output is adjacent to its input components on the other two sections. See Figure 1.

The three main sections of the transceiver were laid out as in figures 2, 3 and 4, allowing a space the width of a double-sided circuit board between the VXO and the transmitter sections. This was to accommodate an RF/Heat shield. I initially thought it would be necessary to shield the Output transistor from the oscillator, but since the casing of the final transistor is grounded it was not necessary. I left it in as a heat shield.

With the exception of the VXO which has been rede-

signed, the component layout is a combination of the original drawings by Paul Harden NA5N in Fall 2000 issue of QRPp, ideas taken from Jim Kortge K8IQY's article in Spring 2001 QRPp and photos on the website of Chuck Adams N7QO.

I have moved the TiCK keyer from the VXO section to the transmitter section, added a fuse and a 15v zener (D201) at J4 and allowed spaces for mounting the controls right on the printed circuit board. You will notice that all the resistors are mounted in the prone position rather than being upright as in the traditional Manhattan style. This was a personal preference as I thought it better defined the streets of Manhattan. To fit everything onto one board, in a few non-critical positions I chose 1/8 watt resistors rather than the common 1/4 watt variety. A 1/4 watt resistor positioned upright would also have worked.

EXPANDING THE VXO COVERAGE

Attempts at increasing the inductance of L14 resulted in the crystal oscillator becoming unstable or not oscillating at all. The decision was made to use two 16 KHz crystals in parallel to reduce their Q and add a buffer taken from ARRL's 1977 edition of "Solid State Design for the Radio Amateur" by Wes Hayward, W7ZOI and Doug DeMaw, W1FB on page 50. I also used the doubler circuit from page 42 incorporating a trifilar wound broadband transformer for T3. The schematic of the modified VXO is shown in Figure 5.

There are three components in the VXO that have an effect on how far the coverage can be expanded - the crystal, the inductor and the tuning diode. The following experiments were conducted to optimize the selection of each of these components to achieve my goal of 50 Khz of frequency coverage.

Given a 3.932 KHz IF and the fact that the VXO is followed by a doubler circuit, Table 1 compares the target frequency range with the VXO frequency needed to obtain the

desired results.

The objective of my experiments was to select components that would yield a VXO range from 15,975 KHz to 16,000 KHz

10 M	28,000	28,018	28.060	28,068
VXO	15,962	15,975	15,996	16,000

TABLE 1

Since all 16 MHz crystals are not created equal, I took a selection of a dozen crystals and tested them individually in the VXO circuit using a 3.3 uH inductor for L14 and a 1SV149 tuning diode. Each crystal was checked for its frequency without the frequency adjusting components connected (i.e. the junction of L14 and X6 grounded). Then the inductor and tuning diode were introduced to see how far the crystal could be bent. I selected the two most flexible crystals and paired them together. See Table 2.

	VXO (0v)	Xtal Grounded
Y6a	15,996.0 KHz	16002.9 KHz
Y6b	15,997.1 KHz	16,002.6 KHz
Y6a & Y6b (parallel)	15,991.4 KHz	16,004.6 KHz

TABLE 2

The next component to be chosen was the tuning diode while keeping the selected dual crystals and the 3.3 uH inductor constant. I had randomly gathered a group of 7 tuning diodes for testing. Each type exhibited a different result, but unlike the crystals, tuning diodes of the same type gave iden-

tical results. Table 3 shows the frequency coverage of each tuning diode in KHz.

TUNING DIODE	MIN (0v)	MAX (8v)
MVAM109	15,990.3	16,000.8
MV209	16,002.6	16,009.0
MV2104	16,007.1	16,010.8
MV2105	16,006.2	16,009.5
MV2107	16,004.2	16,006.4
MV2209	16,001.6	16,004.0
1SV149 (MVAM108)	15,990.3	16,001.0

TABLE 3

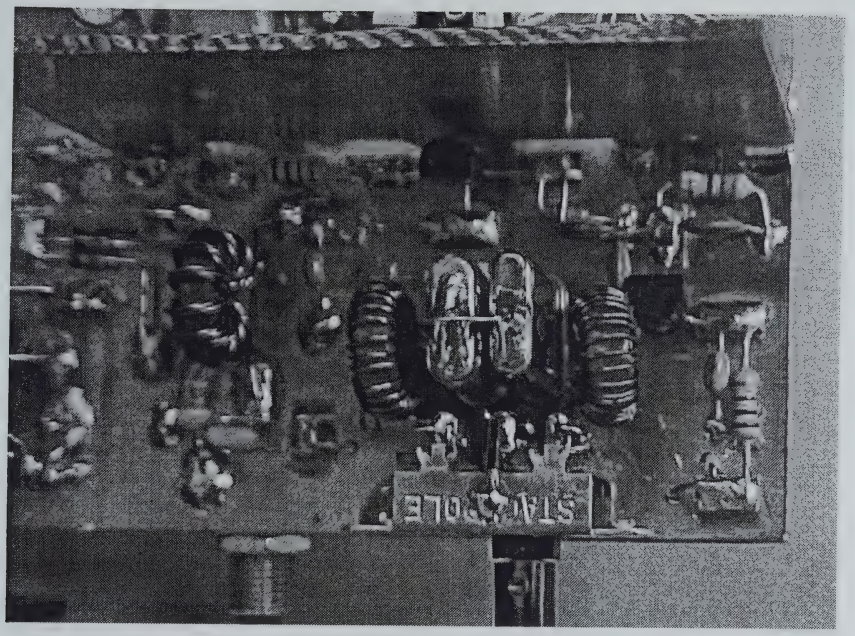
The results of this experiment were surprising since several of the tuning diodes selected moved the 16 MHz crystal frequency higher rather than lower as expected. None of the tuning diodes came close to reaching the target range of 15,975 KHz to 16,000 KHz using a 3.3 uH inductor for L14. MVAM109, MV209, MV2209 and 1SV149 were chosen for the next phase since they were able to pull the crystals the furthest.

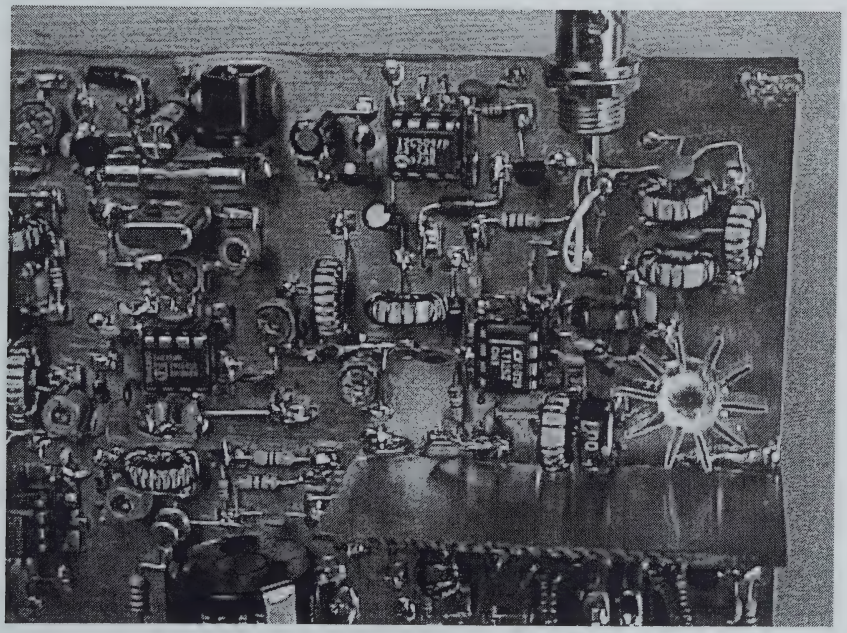
With the buffer stage added, it was now possible to increase the inductor value while still maintaining oscillation. Table 4 shows the results of various values for L14 greater than 3.3 uH.

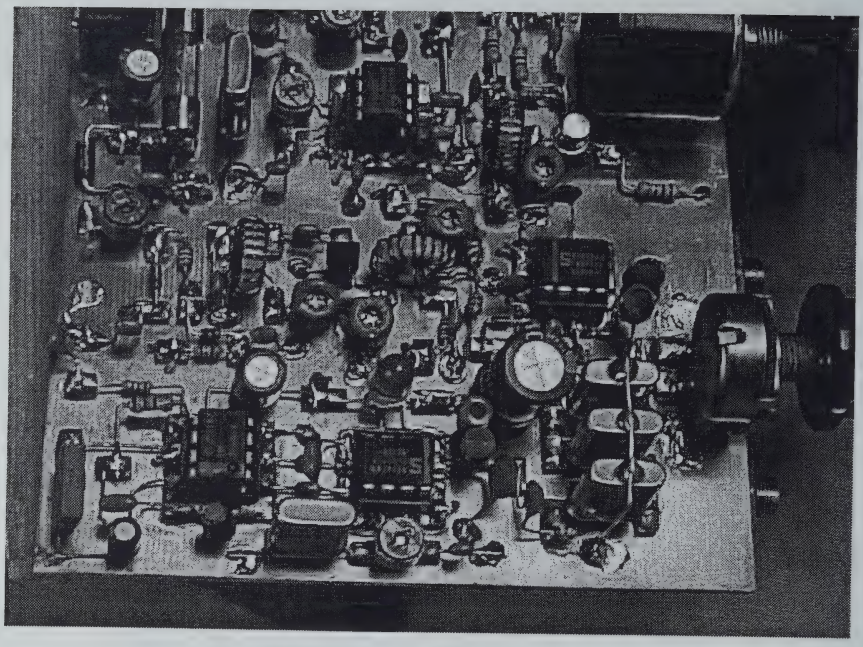
4.0 uH INDUCTOR:

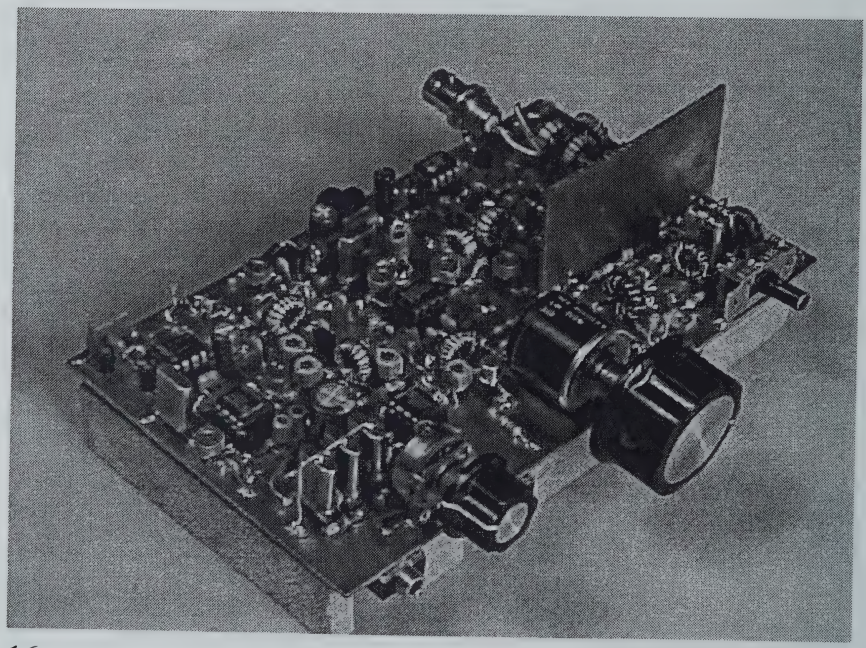
TUNING DIODE	MIN (0v)	MAX (8v)
MVAM109	15,986.6	15,997.6
MV209	16,001.6	16,008.2
MV2209	16,000.4	16,003.1
1SV149	15,986.7	16,000.4

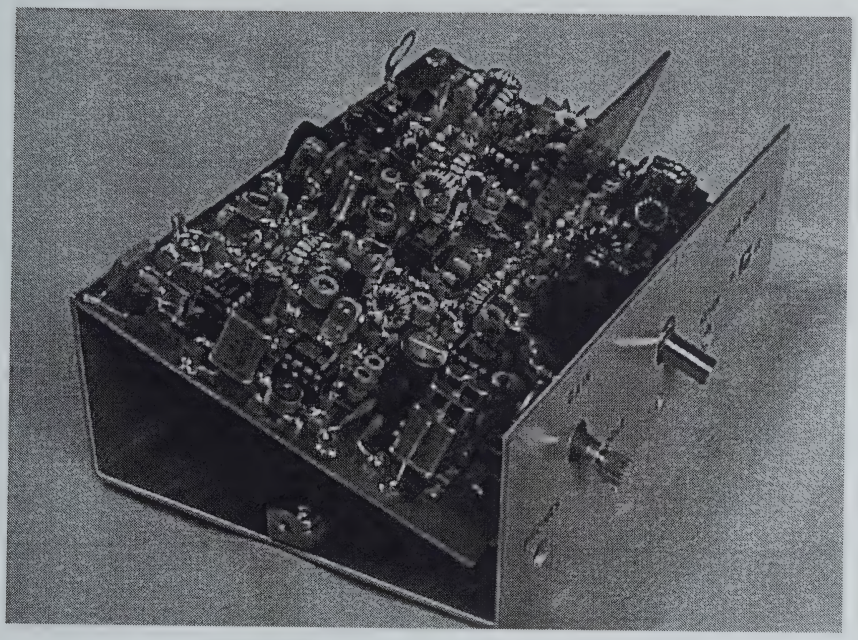
Pictures of Frank Robert's Iowa QRP 10 in various stages of construction.

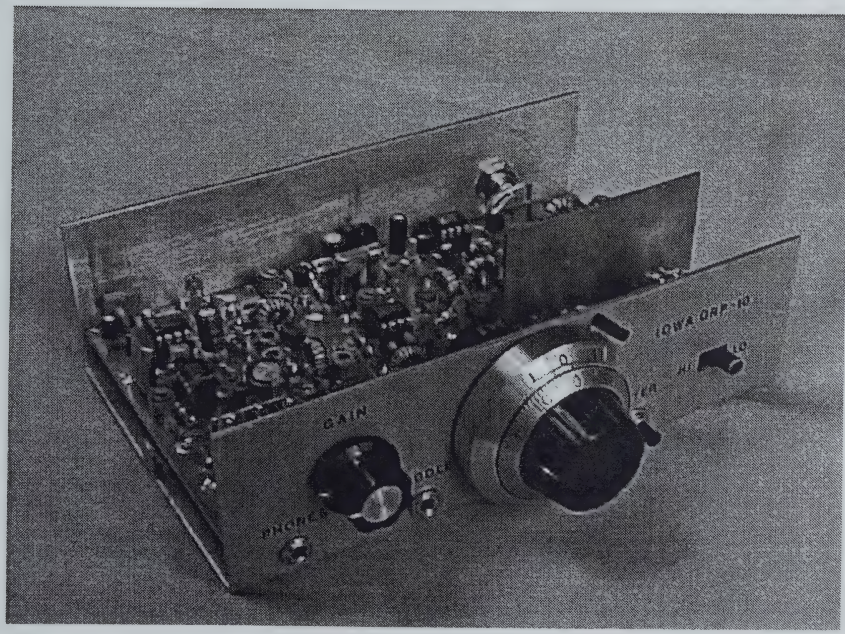











IOWA QRP-10
GAIN

4.5 uH INDUCTOR:

TUNING DIODE	MIN (0v)	MAX (8v)
MVAM109	15,980.0	15,995.4
MV209	15,999.7	16,006.8
MV2209	15,998.3	16,001.4
1SV149	15,979.9	15,997.0

4.7 uH INDUCTOR:

TUNIG DIODE	MIN (0v)	MAX (8v)
MVAM109	15,975.5	15,993.1
MV209	15,998.4	16,006.1
MV2209	15,996.9	16,000.5
1SV149	15,975.3	15,995.8

TABLE 4

Although the lower frequency objective was reached with both the MVAM109 and 1S149 tuning diodes coupled with the 4.7 uH inductor, I was hoping that I would be able to switch between two tuning diodes, as in the original design, to obtain the desired 50 KHz frequency range. Unfortunately there was no combination of tuning diodes that did not leave a gap in the coverage and worst of all, the gap fell right at 15,996.0 KHz, which relates to the QRP calling frequency.

The result of all these experiments was the realization that I could use one tuning diode instead of two and switch inductors to achieve the desired frequency coverage. Table 5 shows the results of my final selection using the MVAM109 tuning diode and switching between 3.3 uH and 4.7uH induc-

tors. Although the 1SV149 had slightly greater coverage, it displayed some instability around 15,998 KHz.

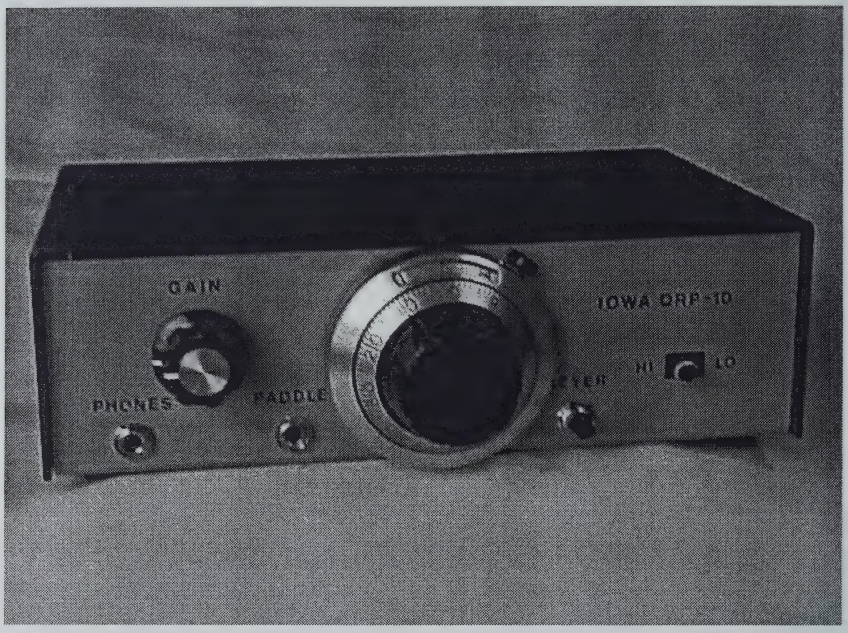
4.7 uH INDUCTOR	3.3 uH INDUCTOR
15,975.5 - 15,993.1	15,990.3 - 16,000.8

TABLE 5

There is a 2.8 KHz overlap that can be reduced by changing the separation of the turns on the toroids used for the inductors.

I would like to thank Jim Kortge, K8IQY for his encouragement and valuable assistance via e-mail during the building of the IA QRP-10. Also thanks go to my brother Ken, VE3BGW for his encouragement and editing during the writing of this article. I am pleased with the resulting transceiver and it is a worthy addition to my ham shack.

Frank Roberts VE3FAO



A Potpourri of Audio Amplifiers

by Mike Martell, N1HFX

At a recent RASON meeting, I gave a presentation of how to design audio preamplifiers. I thought it would be nice if we could now build some audio amplifiers to bring the output from these preamplifiers to levels which could drive a speaker. I intentionally avoided the use of IC amplifiers to provide a real learning experience for audio amplifier design. Although many IC amplifiers provide excellent performance at low cost, we need to learn the basics first. I will address IC audio amplifiers in a future article.

Figure 1 is an interesting audio amplifier which provides almost a watt of audio with a very low standby current of only 45 milliamps. This circuit is really a current repeater formed by Q2 and Q3 and driven by Q1. This circuit is similar in performance to many IC amplifiers but requires an initial bias adjustment. R2 controls the bias and should be adjusted so that exactly ½ of the supply voltage is measured at the

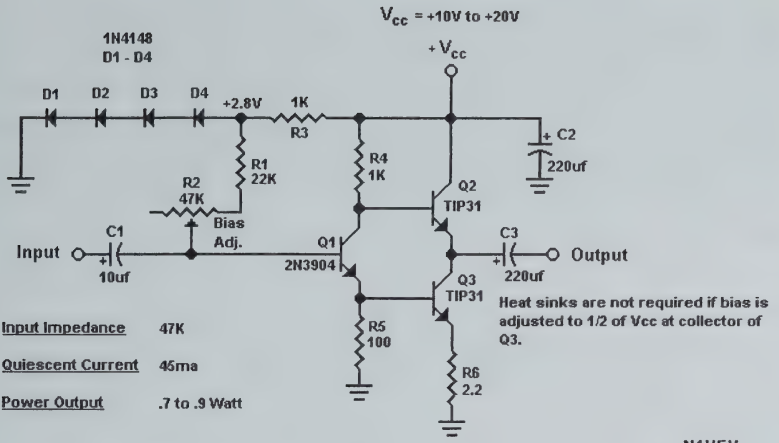


Figure 1

collector of Q3 with no signal. Once adjusted, heat sinks are not needed for Q2 and Q3 and a very high input impedance of approximately 47,000 ohms is seen at the input. Diodes D1 through D4 provide a constant voltage of 2.8 volts and form a constant current source through the base of Q1. This circuit is almost as good as some audio amplifier IC's and is preferred when a minimum power drain is needed.

The circuit in Figure 2 is a classic Class A audio am-

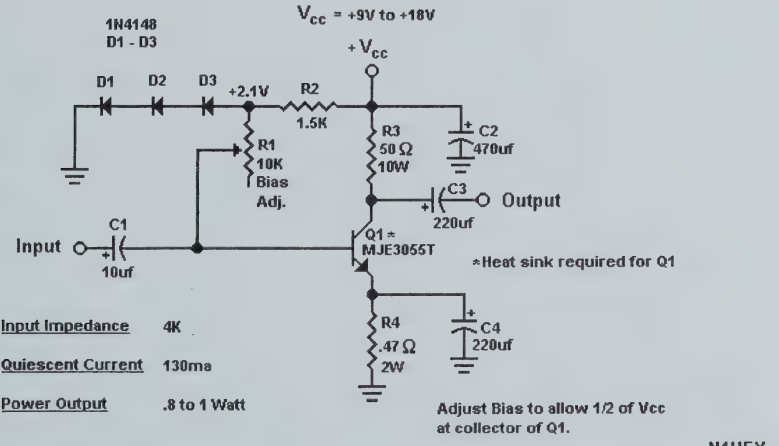


Figure 2

plifier utilizing the same biasing system as in the circuit of Figure 1. While it is possible to set the bias by using only 2 resistors, this does not give the flexibility to operate from a wide range of supply voltages. By adjusting the bias manually, we can optimize the amplifier and guarantee that ½ of

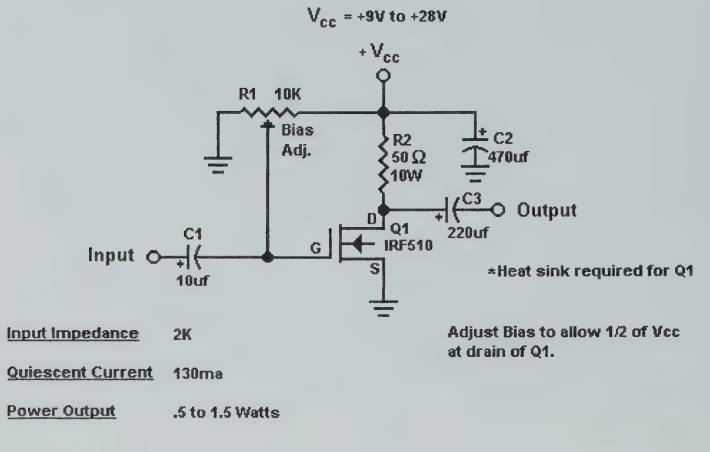


Figure 3

our supply voltage appears at the output no matter what the supply voltage is. This arrangement gives us maximum power out with minimum distortion. The circuit in figure 2 features low distortion and very low noise at the expense of a much larger standby current. Of course, this large standby current requires a heat sink for Q1. Resistor R4 prevents thermal runaway and it is bypassed by C4 to maximize gain. The actual gain obtained will vary depending on the HFE of the transistor used along with the supply voltage. I recently built two of these circuits and used them as a stereo booster amp for a portable CD player with excellent results.

The circuit in Figure 3 features a power MOSFET operating at class A. This circuit is particularly interesting because of the low parts count. The bias should be set for ½ of the supply voltage at the drain of Q1 as in the previous circuits. There is no resistor at the source of the transistor

simply because thermal runaway is not a problem for power MOSFET's. This circuit has a large standby current requiring a heat sink for Q1. This circuit will not perform as well as the previous bipolar designs when operated at a mere 13.8 volts. At such low voltages, we can not expect more than a ½ watt of power. MOSFET's work best when operated at higher voltages and this circuit will easily give us 1.5 watts or more if we operate it at 28 volts.

I hope you enjoy building and learning about these audio amplifier circuits. All of these parts can be obtained at any Radio Shack for the faint of heart. Remember, the only way to really learn how these circuits work is to actually build one.

DE N1HFX

Integrated Circuit Audio Amplifiers

By Mike Martell N1HFX

In a previous article I discussed building audio amplifiers using discrete transistors. While it is possible to build good audio amplifiers from discrete transistors, they are no match for the many audio amp IC's available to us. IC's offer many advantages including high efficiency, high gain, low standby current, low component count, small size and ,of course, low cost. It is little wonder that audio amp IC's have replaced discrete transistors in most consumer electronic devices. While many experimenters have stayed away from these little black mysteries, I am going to uncover some of their secrets and demonstrate how easy they are to use.

Our first IC amp is listed in Figure 1 and uses a LM386 IC. The LM386 comes in 3 flavors now; LM386-1, LM386-2, LM386-3 with output power levels of 300, 500 and 700 milliwatts respectively. The type sold by Radio Shack is the LM386-1 and is the one we used in this circuit. Perhaps the most unique feature is that it is available at any Radio Shack and can operate at voltages as low as 5 volts. Just like regu-

lar op amps, audio amp IC's have an inverting and non-inverting input. Input signals are normally fed to the non-inverting input while the inverting input is normally tied to ground. Because of the high gain of IC audio amps, it is highly recommended to isolate them from the power supply to prevent oscillations. In this circuit, R1 and C1 accomplish this task very well. Resistor R3 controls the gain and Capacitor C3 couples the output to the speaker. Output capacitor coupling is mandatory in just about all IC audio amp designs.

The LM386 IC is unique in that the gain can be modified by changing Resistor R2 and Capacitor C2. This configuration will give us a gain of 20. By removing R2 and connecting C2 across pins 1 and 8, we can increase the gain to 200. It is important to understand that increasing the gain does not increase the output power. The increased gain is only used when a very low input signal is to be amplified.

Our next IC is the LM380 and it also comes in two flavors; LM380-8 and LM380 with output powers of 700 milli-watts and 2 watts respectively. Figure 2 depicts the LM380-8 and Figure 3 depicts the LM380. The LM380-8 comes in an 8 pin package and its basic circuit is virtually identical to the LM380 except for the different pin out. The LM380 comes in a 14 pin

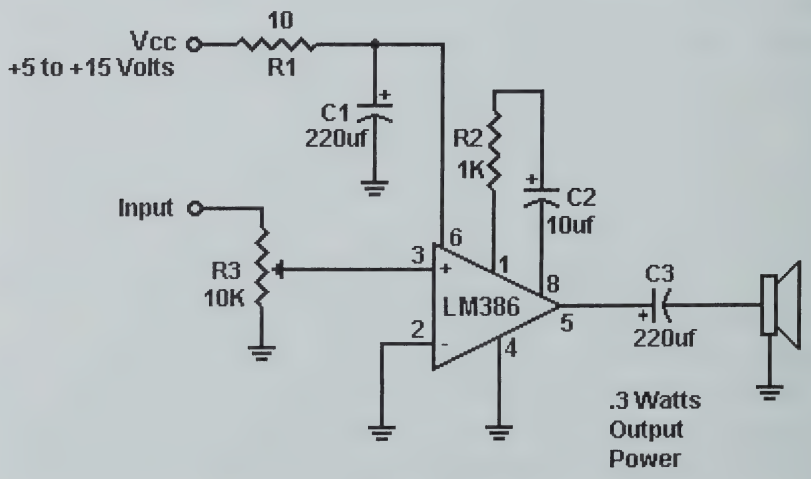


Figure 1

package and pins 3,4,5,10,11 and 13 are connected to ground to act as a heat sink. Experience has shown the LM380 should be soldered directly to the circuit board (no IC socket) if it is going to be operated at its full rated 2 watt output. This IC can become quite warm and it's important to get rid of excess heat through the pins. The primary advantages of the LM380 series IC's are higher output power, very low distortion and low external parts count

No matter how much volume, an audio amp provides, there are still those who require even more. The circuit in Figure 4 uses a LM383 IC amp and will provide up to 7 watts of output power for those who want to really experience their audio. The LM383 comes in a TO220 type package with 5 pins as indicated in Figure 4. My experiences with this IC revealed that it must be heat sinked at all times due to it's high standby current. If you plan to use this IC keep all components as close as possible to the IC and be certain that your power source can supply up to 1.3 amps of current. The main advantage to this IC is its 7 watt output which is why it

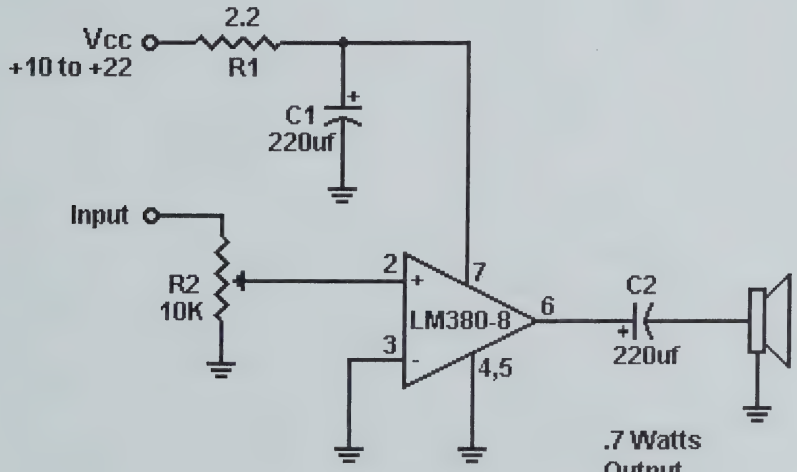


Figure 2

has found its way into many inexpensive car radios. This IC offers low distortion and is a real bargain compared to discrete transistors.

It should be apparent now that audio amp IC's have much to offer us in the way of low cost audio amp circuits.

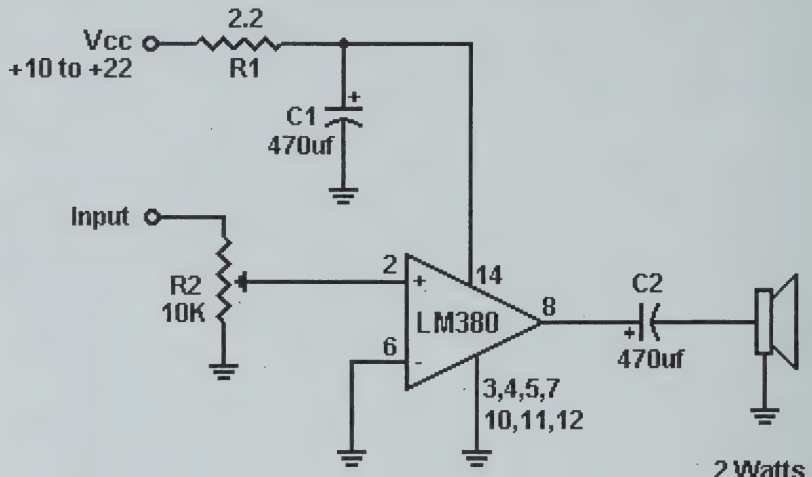


Figure 3

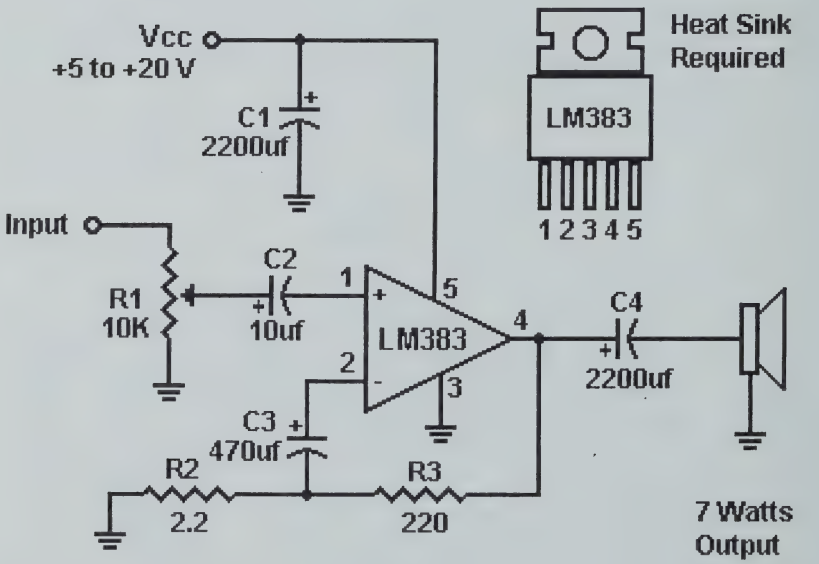


Figure 4

data sheets can be easily obtained by searching the world wide web. Almost all of the major IC manufacturers now offer their data sheets to be downloaded free at their web sites. For example, check out National Semiconductor at http://www.national.com/design/ and Motorola at http://mot-sps.com/cgi-bin/dlsrch for all kinds of information on a wide array of IC's and other solid state devices.
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The Club Sandwich Project

by Monty Northrup, N5FC

Recently, at our local QRP club meeting, someone joked that it would be a marvelous sight to see all our various Altoids-packaged projects connected together to form a station. We all chuckled at the visual suggestion, but later I got to thinking more along those lines.

What I propose here, as an outgrowth of that interesting suggestion, is a project I have dubbed the "Club Sandwich". As the title implies, the project is intended for amateur radio clubs. It provides a unique opportunity to exercise individual creativity under the umbrella of a team project, increase overall knowledge of radio system hardware design, and provide a continued base for experimentation in the club. The most promising and rewarding aspects, however, may well be the opportunity for increased comradery, renewed interest in club activities, and just plain ol' radio-fun. As conceived, the project is sure to interest both newcomer and old timer alike, and bring the two together.

The Club Sandwich takes the form of a simple construction project; in our example, a QRP CW transceiver. It is composed of several smaller sub-projects, representing modular functions, to eventually be connected together to form a working transceiver. Imagine a half-dozen or more Altoids boxes, interconnected with shielded cables. Larger clubs may want to consider more complex projects. When completed, it may be used for field day, or "checked out" by members for a short time.

What Kind of Project Should We Pick?

The specifics of the project should be tailored to the interests and skill-levels of the club membership. Common hardware elements should be defined, simply so everyone is on the same page, interconnection wise. Likewise, it's important to have a technical goal (sometimes called a "specification") and a plan to go with it (sometimes called a "system design"). I hestitate to use the latter terms, because in-

formality should be modal in a project like this. Aside from the specifics of the hardware and design, there are some intangible but esssential elements for the Club Sandwich; we'll speak in terms of of our example, a QRP CW Transceiver:

· Modular Construction - The transceiver is broken down into well-defined, weekend-sized construction projects (OK, sub-projects), to be constructed by individuals or small teams, in their own spare time.

· Flexibility - Modular sub-projects can be removed and replaced readily to facilitate experimentation and improvements.

· Compatibility - A system design approach ensures common elements (like interconnecting hardware, power supply voltages, and input/output specs).

· Utility - While the construction techniques and layout may be unconventional (or even bizarre), the transceiver will ultimately be usable, and suitable for on-the-air operations.

· Charm - What could be more charming than a half-dozen or dozen · Altoids-boxes linked together to form a working piece of ham gear?

· Uniqueness - No two "Club Sandwiches" will be alike; they will reflect the skills, ingenuiity, and humor of the members of that unique club.

· Renewability - as time passes, modules may be added or replaced, resulting in an entirely "new" project, while reusing elements which remain suitable for the current application.

Sounds Cool! How Do We Get Started?

Begin by assigning a team coordinator. Did I say assign? OK, elect or proclaim a volunteer as your team coordinator. If at all possible, that should be a person with good people skills and broad technical experience. This is the person who will coordinate the participating members, and keep the "big picture" in mind should things go astray. Once you've selected your team coordinator, you're ready to begin.

The "system design" approach suggested here is loosely

based on proven techniques used in commercial engineering. System design consists simply of the following: Agree on the goal, formulate a plan, produce a preliminary design, implement the prototype, test and modify it, integrate the system, and document what you've got. In the case of the Club Sandwich, individual modules are designed, built, tested, and documented by individual club members on their own time (though perhaps with the help of a mentor or assistant). Integration of individual modules is done at a club meeting, so the project can be appreciated and discussed by all. Let's look at these individually:

· Agree on a Goal - Figure out (together) what your project will be. This need not be formal, but try to find something that everybody who wants to participate will enjoy, both during and after construction.

· Formulate a Plan - Let an individual with homebrewing experience (or a committee of like individuals), come up with a "plan of attack". This means figure out how to reach the intended goal, while breaking the project into bite-size pieces. A Block Diagram will suffice as the "output" of this step, with a copy going to each participating club member. An input/output specification for each module (or block) would enhance the future success and forestall a lot of unnecessary questions. The plan is considered "in place" when the majority of modules and tasks have been assigned to individuals. Again, keep in mind, all assignments are predicated on volunteerism (and I don't mean that like the Army means it). We'll address the formulation of a Block Diagram below, under another heading.

· Produce a Design - Here, the individual (or small team), breaks out the books, magazines, and the calculator, and selects or designs a circuit that will do the assigned task of the module. Quite likely, they'll put a pencil to a greasy yellow sheet of paper, and make a list of needed parts. Obviously, since there are many modules involved, there will be many individuals working independently at this point. This could take

several months, with monthly meetings being used to network with others and get help or confirmation for the design, if desired.

· Implement a Prototype - To do this, the individual procures parts for her/his module, and puts it together. This also could take several months, with show-and-tell of progress at club meetings. Be sure to network with others, to trade parts and minimize costs.

· Test and Modify the Prototype - Again, this is an individual process, performed on the individual module, and could take a while, depending on the skill levels involved. It's very important to network, via e-mail or eyeball, or at club meetings, so that individuals can successfully accomplish testing without frustration. This is an opportunity for members who have good test equipment to connect with those who do not. The outcome of testing is almost always modification, so don't be surprised when that's the case.

· Integrate the System - When enough modules have been constructed by individuals, it'll be time to hook them together, apply power, and wait for the music (or the CW). Best to do this at a club meeting, where everybody can share in the triumphs of individuals and club.

· Document What You've Got - As a minimum, the individual constructors should provide the greasy schematic with parts values, and part numbers for unique parts. Put it in a common notebook to accompany the equipment. Somebody in the club simply must volunteer to be a photographer (ya gotta have pix!). If the club or a club member has a web page, try to post the documentation so the whole world can admire your work.

The All-Important Block Diagram

The Block Diagram is probably the easiest way to "put-down-on-paper" what you specifically want to accomplish. I suggest one block for each assignable sub-project (module). I also highly recommend a set of written input/output specifications, so people constructing the individual modules un-

derstand exactly what's coming at them, and what they're expected to provide. This is all really pretty simple, but worth the time and effort in the long run. At the bottom of this page, I'll provide an example, based on a QRP CW Transceiver, which you may review as a model for your own project, or adopt outright.

When creating the block diagram, keep the following in mind:

· Overall Functional Goals - Club members should agree on what they want the final hardware to do. Always keep these goals in mind. HINT: Start simple, but keep future expandability and re-usability in mind.

· Modularity - Break your transceiver into small, workable sub-projects. Think of what can be constructed in a weekend. Consider the ability to replace any stage in the future, should someone want to experiment or improve the design.

· Form Factor - Agree on the packaging methods. We suggest the · Altoids-boxes (or similar) for enclosing each sub-project. This forces the projects to be small, simple, workable units, and the metal box is dirt cheap, widely available, and provides excellent shielding.

· Interconnections - Agree on how stages will interconnect, and define that for each stage in the design (each block or module). We suggest RG-174 and RCA phono jacks/plugs wherever possible, because they are cheap and readily available. For RF power stages, we recommend BNC hardware, for equipment compatibility and good shielding. And for power, we recommend 5.5 x 2.5 mm barrel-type power connectors, for their availability and universality.

· I/O - Define all inputs and outputs for each module. By specifying input and output impedances and expected output levels, you assure that any element can be replaced in the future by a new design. Don't forget control signals... these can really mess you up if they are not defined. But keep in mind that you want to give the individual designer/constructor maximum freedom, and don't narrow things down so much that their creativity is stifled.

· Power - Agree on the power requirements. We suggest 9-15 V, so that any module may be operated on a 9V battery (for testing), and a 12V battery that's charging.

· KISS - (Keep It Simple, Silly) The "Club Sandwich" is intended to be a fun, team project, not an engineering breakthrough. Keeping it simple is part of the challenge (and reward).

· KIRC - (Keep It Really Cheap) By keeping the sub-projects small and using inexpensive components, you'll increase participation among members and encourage sharing designs with the general ham population.

· TEAM - OK, we all know what this means, right? Find a way to include every club member that wants to participate. Some may not want to build a module, some may only want to do paper design; some will help with documentation or provide parts, or mentor another.

· TIME - Keep the timetable loose and flexible; with busy personal schedules, and given the volunteer nature of the membership, along with the different skill levels involved, this project can take several months. If an enthusiastic and skilled member has more time, and gets done early, create new modules, different versions of the same module, or assign them to mentor.

Once the block diagram is drawn, make a list or table of the requirements for each block element. This will form the module specification. Include:

· The name of the sub-project

· Its function (i.e., Mixer, Receiver Preamp, IF amplifier with AGC, etc)

· Name all I/O ("RF in", "AF Out", "Key In", etc)

· For each I/O port, define frequencies, impedances, and expected signal levels

· For each I/O port, define what connectors are to be used

· Any required operator controls ("Tune", "Gain", "On/Off")

· Any special or internal specifications (though we like to leave this to the individual)

Block Diagram of Club Sandwich

· Expected power supply range

From Block Diagram to Individual Designs

When creating the block diagram and module specs, stay flexible, but keep the "big picture" in mind. Individuals may want to alter their module's specifications, and in some cases this will certainly be warranted. But in a project like this, changing specifications can have a ripple effect. For example, let's say the person building the keying circuit decides to use 5 Volt logic, when 12 V was specified. Now, every module that used keying (and there are many) will need to be redesigned. It is the job of the team coordinator to "see the big picture" and steer individuals back to a reasonable solution.

This is not to say that individuals constructing sub-projects do not have latitude. In fact, they have a lot. Circuitry, parts selection, and construction methadology are all at the descretion of the individual or sub-project team. Want to do something innovative? Do it! Use proven methods! Go ahead! Use surplus parts? Why not? Use an exotic sample? Who's to stop you? Machine your own capacitors? Grow your own silicon? More power to you. The point is, there's a lot of room for individual expression here, while staying within the agreed guidelines and specifications.

Every participating individual should receive a copy of the block diagram. This helps them keep the "big picture" in mind, a valuable reminder when you're designing and building a part of the whole. As the sub-projects are completed, give each individual a chance to "show-and-tell", and put their schematic and parts notes into the comprehensive project notebook. Make sure their name and call are on the paperwork. Hand-drawn schematics and hand-written notes are fine.

This is guaranteed to be a learning experience for every club member. Members who have no building experience will have to crack a book, and ask questions. Experienced builders will have to work within the bounds of specifications,

expand their horizons, and help others. Everyone will see how their little piece support the whole, whether it be a piece of hardware, some documentation, the acquisition of parts, or some individual expertise.

An Example, and a Proposal for the First Club Sandwich

As a starting point, we offer the attached block diagram of a QRP CW Transceiver. Frequencies have not been specified; you should select a band, and decide on an IF frequency. We suggest, for starters, 40, 30, or 20 meters. Use cheap microprocessor crystals for the IF filter and mixer injection, all the same frequency. If you use both transmit and receive mixers (as shown in the example), you'll generate sidetone directly. If you want to keep it really simple at first, ditch the IF and build a direct-conversion receiver, and/or use a VXO for your transmit source. We'll go all the way with our example, showing a single band, 3-5 Watt CW transceiver, with good flexibility and expansion capability to SSB or digital modes. We'll show a conventional VFO, but there's no reason a DDS or PLL couldn't be substituted (thus getting the digital and software types involved). Or, build all 3 individually, and try them all out (that's the power of modularity). See the Block Diagram on the next page.

Club Sandwich Block Diagram Specifications

Module: Receiver Band Pass Filter
Function:
Provides filtering at input of receiver to reduce image and reduce unwanted out-of-band signals
Input/Output:
- RF IN: 50 ohms, RCA Jack
- RF OUT: 50 ohms, RCA Jack

Key Specs or Limitations:
Frequency range: To be determined
Misc Notes:

Typically, this is a double-tuned circuit, or a high-Q preselector with a "peaking" control
Adding a switchable attenuator might be useful here also

Module: Receiver Preamp
Function:
Improve noise figure and sensitivity, and provide 10-12 dB of pre-mixer gain
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- RF IN: 50 ohms, RCA Jack
- RF OUT: 50 ohms, RCA Jack

Operator Controls:
- IN/OUT Switch (Optional: to bypass preamp when gain not required)

Key Specs or Limitations:
Gain: 10 - 13 db (fixed)
Noise Figure: < 3 dB
Misc Notes:
May be narrow band (i.e., single band) or broadband 3-30 MHz (for broadband, please equalize gain)

Module: Receiver Mixer
Function:
Convert pre-filtered RF to IF (or to audio if direct-conversion receiver)
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- RF IN: 50 ohms, RCA Jack
- VFO IN: 200 ohms, RCA Jack
- IF OUT: 200 ohms, RCA Jack

Operator Controls:
- No operator controls anticipated

Key Specs or Limitations:
- Frequencies In/Out: To be determined

- Gain: 10-15 dB (fixed, RF to IF Voltage Gain)
- Noise Figure: < 6 db
- Tank Circuits: min 1 tank circuit in output stage (or LPF in D-C rcvr)
- VFO Input: expect 0.25V pk-pk

Misc Notes:

If an active mixer is used (like the NE602/SE612), an output amplifier will probably not be required; if a passive (diode ring) mixer is used, a VFO input amplifier and an IF/AF output amplifier will be required. Amplifiers, if used, should have tank circuits to minimize unwanted responses

Module: Post-Mixer IF Amplifier

Function:

Reduce Noise and provide gain/AGC prior to IF filtering

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- IF IN: 200 ohms, RCA Jack
- IF OUT: 200 ohms, RCA Jack
- AGC IN: Zin=1K; 0 to 2.5V (0V = Max gain, 2.5V = 20dB down)

Operator Controls:

- Manual Gain (Optional, in case AGC not available)

Key Specs or Limitations:

- Frequency: To be determined (Audio if D-C receiver)
- Gain: 6- 10 dB at max gain (i.e., at AGC= 0V)

Misc Notes:

Module: IF Filter

Function:

provide narrow-band filtering at IF Frequency (not required for direct-conversion receiver)

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack (if

required)

- IF IN: 200 ohms, RCA Jack
- IF OUT: 200 ohms, RCA Jack

Operator Controls:

- No operator controls anticipated

Key Specs or Limitations:

- Crystal Ladder Filter or equivalent
- Minimum 3 crystals (more preferred)
- Use crystals specified for 20 pf load capacitance

Misc Notes:

Module: Post-Filter IF Amplifier

Function:

Provide gain/AGC after IF filtering

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- IF IN: 200 ohms, RCA Jack
- IF OUT: 200 ohms, RCA Jack
- AGC IN: Zin=1K; 0 to 2.5V (0V = Max gain, 2.5V = 20dB down), RCA Jack
- SAMP OUT(Optional): Zout < 200 ohms, RCA Jack (provides sample of IF for external AGC generation, if used)

Operator Controls:

- Manual Gain (Optional, in case AGC not available)

Key Specs or Limitations:

- Frequency: To be determined (Audio if D-C receiver)
- Gain: 10- 12 dB at max gain (i.e., at AGC= 0V)

Misc Notes:

Module: Product Detector / BFO

Function:

Provide product detection for CW / SSB; includes BFO

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- IF IN: 200 ohms, RCA Jack
- AF OUT: Zo=200 ohms max, RCA Jack

Operator Controls:

- BFO Frequency Adjust (may be a screwdriver trim)

Key Specs or Limitations:

- Frequency: To be determined
- IF-to-Audio Voltage Gain: 10- 15 db (fixed)
- Use crystals specified for 20 pf load capacitance

Misc Notes:

44414. This stage not used in direct-conversion receiver

44415. If an active mixer is used (like the NE602/ SE612), an output amplifier will probably not be required; if a passive (diode ring) mixer is used, an AF output amplifier will be required. An amplifier, if used, should have low-pass roll-off to minimize hiss and eliminate IF feedthrough to the output.

Module: AF Preamp

Function:

Provide gain for Direct Conversion Receiver (not needed for receiver with product detector)

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- AF IN: Zin >= 2K, RCA Jack
- AF OUT: Zout < 200 ohms, RCA Jack

Operator Controls:

- Gain Control Optional (may be screwdriver trimmer)

Key Specs or Limitations:

Voltage Gain: 10-15 db (fixed)

Output: AC-coupled

Misc Notes:

This stage not required for receiver with product detector stage

Module: Receiver Mute and AF AGC Circuit
Function:
Provide for muting of receiver during keying; optionally provides AGC for receivers with IF AGC (and preferrrably for direct conversion receivers)
Input/Output:
· POWER: 9-15 VDC, 5.5 x 2.5mm power jack
· AF IN: Zin = 10K, Zsource expect 200 ohms, RCA Jack
· AF OUT: Zout <= 200 ohms, Zload = 2K, RCA Jack
· KEY IN: Zin >=10K, driven by CMOS; RCA Jack
· AGC IN (Optional): Zin >= 10K, 0-2.5V, where 0V = max throughput, 2.5V = max attenuation
Operator Controls:
· No operator controls anticipated
Key Specs or Limitations:
· Voltage Gain: -3 to 0db (with AGC = 0V)
Voltage Gain: -20 dB (i.e., minimum loss, more loss is prefrrable) (with AGC = 2.5V)
· Output AC coupled
Misc Notes:

Module: AF Filter
Function:
provide audio bandpass shaping or filtering, as appropriate for CW or SSB
Input/Output:
· POWER: 9-15 VDC, 5.5 x 2.5mm power jack
· AF IN: Zin = 2K, RCA Jack
· AF OUT: Zout < 200 ohms, RCA Jack
· SAMP OUT: Zout < 200 ohms, RCA Jack (2nd buffered output for external AGC generator)

Operator Controls:

- CW/SSB switch
- others as required

Key Specs or Limitations:

- For SSB: LPF with Fc=2.5-3KHz or BPF = 300-3000 Hz

For SSB, midband (1 KHz) gain = 0 dB (i.e., x1)

- For CW: BPF with Fo = 750-800 (fixed, or include that freq if filter is variable)

For CW, Bandwidth (3 dB) 400-500 Hz (fixed)
For CW, Gain at Fo = 4-6 db

- Output : AC- coupled

Misc Notes:

Module: AF Power Amplifier
Function:
Monoraul Audio Amplifier, with two inputs, one for audio, one for sidetone, capable of driving 8-ohm headphones
Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- AF IN #1: Zin >= 5K, RCA Jack
- AF IN #2 (Sidetone): Zin >= 5K, RCA Jack
- HEADPHONES: 1/8 " Stereo Jack
- SPKR (Optional): RCA Jack

Operator Controls:

- AF GAIN (pot)
- SIDETONE LEVEL SET (can be screwdriver trimmer)

Key Specs or Limitations:

- 0.5 mV, 1 KHz Sine at input gives full volume audio with AF GAIN control set midway

Misc Notes:

Module: AGC Generator
Function:

Based on an IF or AGC sample provided, generate AGC Voltage to be utilized by AGC-controlled stages

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- SIG IN: Zin >= 20K, RCA Jack
- AGC OUT: Zout <= 200 ohms; RCA Jack

Operator Controls:

- Switch: ON/OFF/MANUAL

Key Specs or Limitations:

- Input signals of 3 V p-p cause maximum AGC output (i.e. 2.5V); no signal causes near 0 V output
- Full Wave Rectified Detection
- Using switch, AGC may be turned ON or OFF, or a Manual Gain pot may be placed in circuit, with output 0-2.5 V

Misc Notes:

Module: Transmit Mixer and Oscillator

Function:

converts VFO frequency to output RF frequency; includes crystal-controlled conversion oscillator

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- VFO IN: Zin = 200 ohms, expect 250 mV p-p RCA Jack
- RF OUT: Zo = 200 ohms, RCA Jack
- KEY IN: Zin >= 10K, RCA Jack (0V = key-down)

Operator Controls:

- No operator controls anticipated

Key Specs or Limitations:

- Gain (VFO to Output Voltage Gain): 10 - 15 db (fixed)
- XTAL controlled conversion Oscillator must be trimmable +/-1 KHz min
- Use crystals specified for 18-20 pf load capacitance
- Keying applies to either the VFO or XTAL oscillator,

disabling that oscillator during receive periods
- Key-down enables output
- Backwave < 2 mV p-p
- Minimum 1 tuned tank in output circuit

Misc Notes:

Module: Transmit Driver
Function:
Gain and Filter; provides drive to RF Power Amplifier
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- RF IN: Zin = 200 ohms, expect 0.8 V p-p, RCA Jack
- RF OUT: Zout = 50 ohms, BNC Jack
- KEY IN: Zin >=10K, driven by CMOS, RCA Jack, 0 V = key-down (i.e., transmit)

Operator Controls:
- Drive Level (may be screwdriver trimmer)

Key Specs or Limitations:
- Frequency: To be determined
- All stages should be linear (i.e., class A or AB)
- Expect Input signal of 0.8 V p-p into 200 ohms
- Output Power (at Vsupply=13VDC): 350 mW (10.8 V p-p into 50 ohms)
- At least one stage should have a tuned tank circuit
- Output stage should withstand loads of 5-500 ohms without damage
- Backwave (during key-up) should be at least 25 db down (i.e., < 1 mW)

Misc Notes:
Pay attention to keying waveshape, as this will influence final transmitted signal

Module: RF Power Amplifier
Function:

provide 3-5 Watts RF output

Input/Output:

- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- RF IN: Zin = 50 ohms, expect 10.8 V p-p, BNC Jack
- RF OUT: Zout = 50 ohms, BNC Jack
- KEY IN: Zin >=10K, driven by CMOS, RCA Jack 0 V = key-down (i.e., transmit)

Operator Controls:

- No operator controls anticipated

Key Specs or Limitations:

- Class AB preferred for future SSB use, Class C OK
- Gain 12-14 with .25-.35 W drive (typ)
- Broadband topology preferred, single band OK
- Push-Pull preferred for 2nd harmonic rejection, single ended OK
- Output stage should withstand loads of 5-500 ohms without damage
- Negligible backwave when un-keyed (< 1 mW)
- Heatsink may extend outside normal form factor

Misc Notes:

Module: Output Low Pass Filter

Function:

Provides harmonic rejection

Input/Output:

- RF IN: 50 ohms, BNC Jack
- RF OUT: 50 ohms, BNC Jack

Operator Controls:

- No operator controls anticipated

Key Specs or Limitations:

- 5-7 pole filter (7 preferred)
- capable of handling 25 watts (to accommodate mis-matches without arcing)

Misc Notes:

Module: VFO
Function:
Provides injection for Receiver Mixer or Transmit Mixer, as appropriate; includes R.I.T. offset
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- OUT #1: Zo = 200 ohms, RCA Jack
- OUT #2: Zo = 200 ohms, RCA Jack
- KEY IN: Zin >= 10K, driven by CMOS, RCA Jack

(0V = key-down; i.e., transmit)
Operator Controls:
- Main Tuning

Key Specs or Limitations:
- Frequency: To be determined
- Two independently buffered outputs provide 0.25V p-p (0.30V p-p max) into 200 ohms
- Outputs AC Coupled
- Receiver (output 1) offset automatically engaged during receive
- R.I.T control +/- 2KHz min
- Oscillator and tuning stages powered by linear regulator
- For VFO, min 2-stage buffering; For VXO, min 1-stage buffering

Misc Notes:

Module: Keying Control Circuit
Function:
Provides transmit/receive control signals with sequenced delays, to be used by other circuits that need to be keyed
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- KEY IN: 1/8" Mono Jack

Max Input loading (to keyer): 10K (pull-up to Vsupply)

INput states: open = RX; Ground = TX
· KEY0: CMOS/equiv, RCA Jack; Low on key-down, High on key-up (raw keying)
· KEY1: CMOS/equiv, RCA Jack; Low 1 mSec after key-down, High on key-up (keys TX)
· KEY2: CMOS/equiv, RCA Jack; Low 0.5 mSec after key-down, High 0.5 mSec after key-up (keys VFO)
· KEY3: CMOS/equiv, RCA Jack; Low on key-down, High 1-50 mSec after key-up (RX muting)

Key Specs or Limitations:

Misc Notes:

Trimmer or programmable control of KEY3 delay, to accommodate unknown receiver recovery time

Module: Antenna T/R Switch

Function:

Provides switching for antenna circuirt, between transmit and receive

Input/Output:

· POWER: 9-15 VDC, 5.5 x 2.5mm power jack (if power required)
· ANTENNA: 50 ohms (nom); BNC Jack
· RCVR OUT: 50 ohms (nom); RCA Jack
· XMIT IN: 50 ohms; BNC Jack
· TR CONTROL: Control from Keying Control Circuit, RCA Jack

Max Zin = 10K/0.01uF;
Input Signal States: Open or Vsupply for RX; Ground for TX
NOTE: If switching is RF-sensed, this input may not be needed

Key Specs or Limitations:

· Max TX power 10 Watts

Misc Notes:

Module: Sidetone Generator
Function:
generate keyed CW sidetone for injection into audio chain
Input/Output:
- POWER: 9-15 VDC, 5.5 x 2.5mm power jack
- KEY IN: Zin >=10K, to be driven by CMOS (LO=key-down), RCA Jack
- AF OUT: 1 Volt pk-pk

Operator Controls:
- No operator controls anticipated

Key Specs or Limitations:
- Frequency: 750-800 Hz
- Output Amplitude 1 V p-p (nom)
- Output AC-coupled
- No output when un-keyed
- Sine or near-sine preferred

Misc Notes:
This stage not required in receiver that self-generates sidetone from transmit mixer

Interfacing external control software to the FT817

by Graham F Firth G3MFJ/W3MFJ

Some time ago, Bob Freeth (G4HFQ) produced an FT817 control program called FTBasic which he produced as shareware. This program installed on a PC and using a suitable interconnection cable, would remote control the FT817. (Incidentally the program will also control the FT847, FT100 and FRG100). I downloaded and installed this, but before I could use it, I needed a gizmo to convert the RS232 level signals (+12 to -12v) to the TTL signal (0 to +5v) needed by the ACC jack on the 817.

I looked around Internet (well, doesn't everybody?) to

find the circuit and I came up with one that lots of people seemed to be using. Maxim have produced an IC which will do just this, including generating the necessary +10 and -10 volt rails from the chip's main 5v supply. A 5v regulator is needed to obtain the required 5v rail from the FT817.

Although this looks complicated at first glance, the majority of the components are associated with the power supply section of the chip.

Components list:
1 off MAX232 16 pin DIL (with socket if required)
1 off LM7805 100mA 5v regulator
3 off 10uF 16v electrolytics
2 off 3.3k resistors
1 off 0.1uF capacitor
1 off 9 pin RS232 female socket
1 off 8 pin miniature DIN plug

The circuit can be built up on a piece of perfboard, ugly style on blank PCB or even Manhattan style. I chose ugly style & built it in the 9 pin RS232 plug, but I can only recommend this is you are happy working this way as the plug cover has only just enough room for the components.

I must issue a dire warning here - please do not short the wire that supplies the power to the gizmo from the FT817 (the bottom right hand pin looking into the 817). Whilst this has adequate power capability to run the interface, it will not stand being shorted to chassis at all. The output is protected by the tiniest 10 ohm resistor you could imagine - guess how I know? I had to use a powerful magnifying glass just to see it - and I have a copy of the service manual & knew where I was looking! Check and double check your construction before you plug it in!

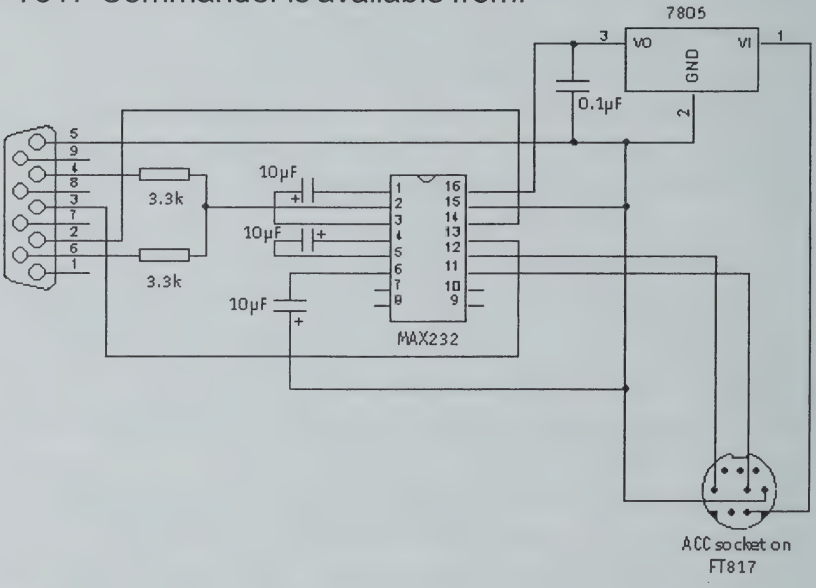
The gizmo worked fine and I paid the registration fee for the software - I was so impressed. However, since then,

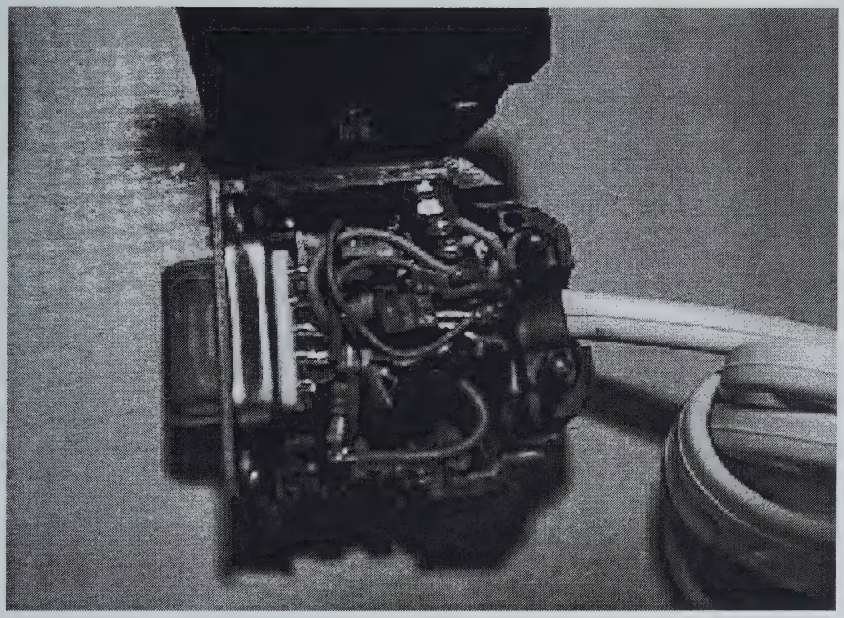
Simon Brown (HB9DRV), has produced a program that is freeware and is called FT827-Commander. It is a much more comprehensive program than FTBasic, I have given the URLs for both pieces of software at the end of this article.

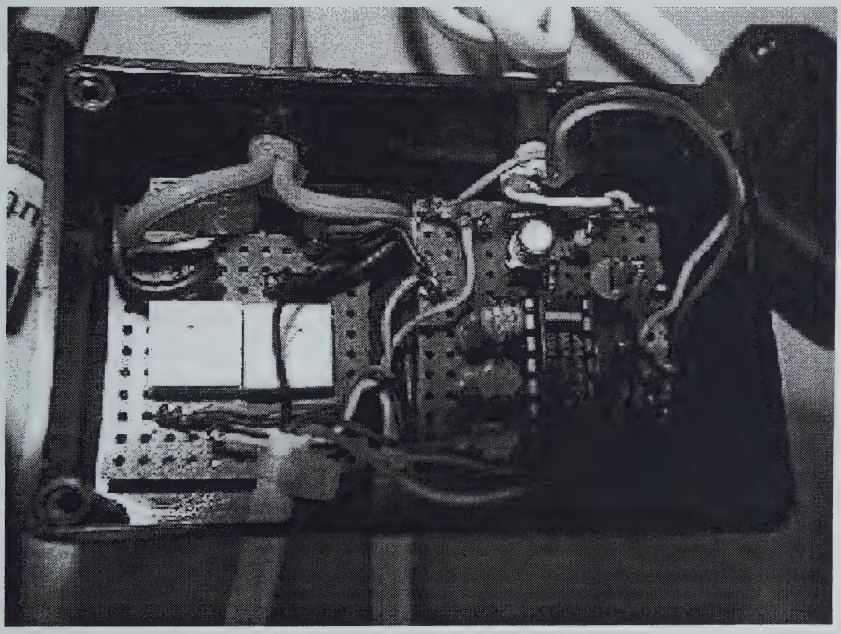
In the next article, I will show how to build this circuit on perfboard and it will include the PSK31 interface as well.

FTBasic is available from:
http://dspace.dial.pipex.com/town/avenue/aci07/polarplot/

FT817-Commander is available from:





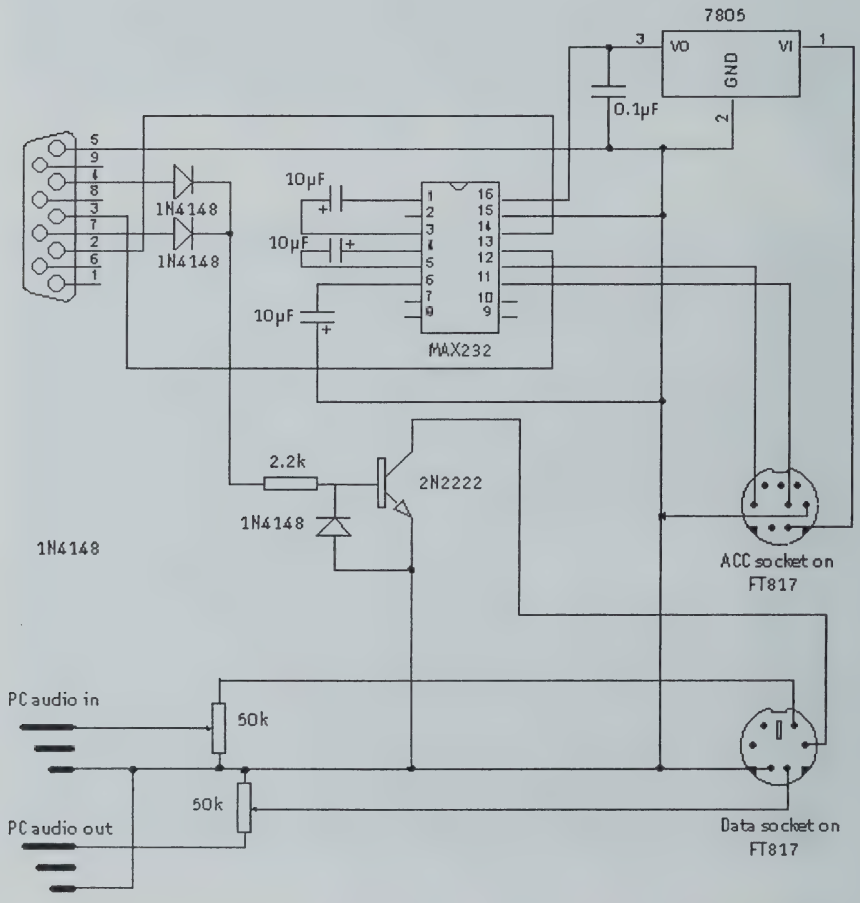


Building an Interface for the External Control Software to the FT817

Graham F Firth G3MFJ/W3MFJ

My last article in this publication showed how a program running on a PC could control the FT817 and enhance the operation of this wonderful little rig. The article before that, showed how to make a PSK31 interface, again to connect the FT817 to a PC.

This time, I am combining these two interfaces, so that the same PC can run PSK31 and provide an interface program at the same time. All the software I previously recom-

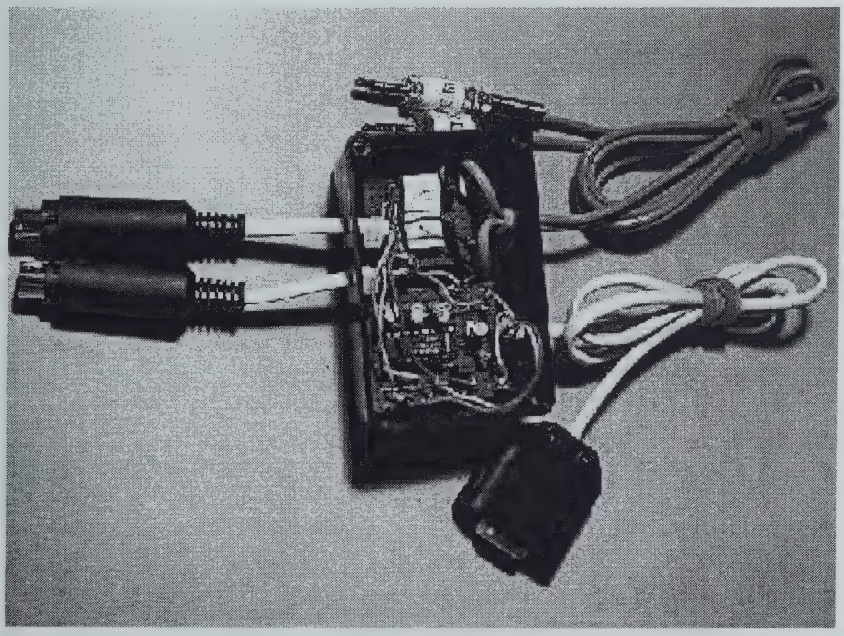


mended will still work ok, but as well as all these, Simon Brown HB9DRV has produced a combined program, still called FT817-Commander, but which incorporates PSK31 Deluxe. This is another variant on the PSK31 software theme.

If you refer to the earlier articles, you can see how this circuit has been obtained.

Again, it is built into a small plastic box and a photo of this is shown below.

Components list:
1 off MAX232 16 pin DIL (with socket if required)
1 off LM7805 100mA 5v regulator
3 off 10uF 16v electrolytics
2 off 3.3k resistors
1 off 2.2k resistor
3 off 1N4148 (or similar) diodes
1 off 0.1uF capacitor



G3MFJ's Complete Interface for the 817

1 off 9 pin RS232 female socket
1 off 8 pin miniature DIN plug
1 off 6 pin miniature DIN plug

My construction this time uses two small pieces of perfboard, one for the electronics, and the other for the two pre-set level control pots.

I must issue a dire warning here again. Please be careful and do not short the wire that supplies the power to the gizmo from the FT817 (the bottom right hand pin looking into the 817). Whilst this has adequate power capability to run the interface, it will not stand being shorted to chassis at all. The output is protected by the tiniest 10 ohm resistor you could imagine - guess how I know? I had to use a powerful magnifying glass just to see it - and I have a copy of the service manual & knew where I was looking! Check and double check your construction before you plug it in!

That's it - I hope you get as much fun out of this as I have.

FT817-Commander is available from:

http://www.kns.ch/sysgem/hb9drv/FT817%20Commander.htm

Arkiecon 2002 Diary

by Tony Fishpool, G4WIF

Last year I enjoyed Arkiecon immensely, but because this year I am attending Fort Tuthill, I really didn't intend to be anywhere near Fort Smith in April - well that was the plan anyway! Eventually I caved in - I just had to get another fix of Arkansas hospitality, and if you've never been, these folk define that word.

Graham G3MFJ had already similarly succumbed to temptation and he had arranged his flights many weeks previously. When I booked late it meant we had to travel separately and so met at Tulsa International late on Wednesday night. We stayed locally and drove to Fort Smith the following day.

Graham's GPS led us directly to Jay's house and soon after the three of us were collecting Vern Wright from the local airport. Vern is one of the most generous guys I know - he donates many of his superb antennas to events such as Arkiecon so that they can be presented as door prizes. Back at Jay's house again we just had time to get reacquainted when Jim (Dr. Megacycle) Duffy called into the local repeater for directions and soon the five of us were catching up on a year's worth of gossip while we sampled the micro brewery products that Jim bought.

Actually, this activity really sums up a large part of what went on over the next few days - I had one enjoyable rag chew after another with friends made from previous years and many new ones. The next old friend to arrive was "gentleman golfer" Dave Yarnes and later that evening we all enjoyed a massive steak each - barbecued by Jay's lovely new bride Kathy. By the time Doug Hendricks rolled in we were sitting back in Kathy's living room wondering if we would ever move again - Kathy cooks really excellent steaks!

The Fort Smith QRP group had negotiated us a fabulous rate at the superb Guesthouse Hotel and the folk at the Guesthouse were great. They allowed us to use the break-

fast room to gather in during the late hours where it was usually "standing room only" for more QRP gossip.

Friday was a day with more and more people arriving. Ed Manuel and the Texas boys rolled in and soon the hotel was buzzing. Back at Bromley Mansions, Jay, Doug and myself beavered away for an hour or so putting together several dozen Tuna-Tin kits. All were sold the following day and such is their popularity we could have sold many more.

Later in the evening, the Ribeye Restaurant had reserved almost all of their tables for us, and it was great to able to renew a friendship with Glen & Gail Reid from Austin as we caught up on events since we were last together a couple of years previously. Those Texas folk also know a thing or two about hospitality!

Last year I took a lot of stick from Doug Hendricks because I didn't try the Turkey Fries, so summoning up the old Dunkirk spirit, I ordered a portion. Having considered the matter carefully I have decided they were better off being a vital part of the Turkey - Doug, they really suck! There being no such thing as a quiet group of QRPers, I felt really sorry for the waitresses as they were battling to hear the orders, but they managed magnificently.

The following morning many people rose at an inhuman hour to eat out at a local diner. I'm not well known for my ability to get up early (or manage large breakfasts) so I ate in the hotel and there had the opportunity to make the acquaintance of Rex KC5UVN and we spent a delightful hour putting the world to rights. Then it was time to get to the Columbus Halls where George Dobbs opened the lectures after a suitable introduction by Master of Ceremonies Doug KI6DS. George spoke first about keeping QRP simple and introduced us to a new word - "pelf" - roughly defined as "the things we don't really need but feel we ought to acquire". In the afternoon George discussed many of his favourite construction techniques.

Roy Lewallen gave us two fine talks. The first was about

antennas and how some manufacturers claim what they do for their products and still manage to get past consumer law by not actually lying (my words - Roy rather was more polite!). The second talk later in the day was about antenna modelling. Roy is gifted with a way of explaining complicated things so they seem easy. I learned a lot from both talks.

Sandwiched between these renowned "Hall of Famers" was Graham G3MFJ who introduced us to a few new things to do with an FT817. Graham explained how simple and freely available software can both remotely control this marvellous little radio and allow PSK81 operation.

Out in the other hall busy exhibitors were conducting brisk business. Dennis Foster had a display of his "Te Ne Keys" and hopefully sold bucket loads because these are really superb morse keys. It was certainly a "lump in the throat" moment when Dennis presented me with a lovely key personalised with my callsign. Dennis is another vendor whose generosity "oils" QRP events like this.

Later in the evening we enjoyed a free barbecue - courtesy of Fort Smith QRP. The food was great and I went up for seconds - I have never had beans that tasted that good!

Once again we retired to the Guesthouse and migrated first to the breakfast room and then up to visit with Dave W7AQK where we played with an FT817 connected up to one of Vern's MP2 antennas outside the window. These antennas really work well and the bands were alive that night as we supped the odd there was some nice Chardonnay circulating too.

Sadly, it all ended too soon as Dave had to get up really early to make his flight at Tulsa, so saying goodbye we moved onto George Dobbs room where there was more beer and other fine folk like Roy W7EL to gas with until the wee hours.

On Sunday again the early risers had gone to IHOP for breakfast but after a more leisurely breakfast I caught a lift with Mike WB5YJX (the new editor of QQ) and Henry whose callsign I regrettably forgot to note. We didn't have the ben-

efit of Graham's GPS, so travelled via the "scenic way" but we arrived after a very pleasant chat in the car. IHOP was fairly heaving with QRPers but eventually we all rather sadly said our goodbyes until the next time.

Jay and the Fort Smith folk put on a fabulous convention for us - with a lot of people quietly working in the wings. I would like to thank Kathy, Kelsey and Win and all the others I have neglected to mention. This is a world class event - you will be sorry if you miss it next year!

QRP Operating

By Richard Fisher, KI6SN
1940 Wetherly Way
Riverside, CA 92506
KI6SN@yahoo.com

Feedback on "Your QRP Accent"

Apparently, last quarter's essay ***"Your QRP Accent, And What to Do About It"*** resonated with a lot of "QRPp" readers.

This low power knock-off of Keith S. Williams, W6DTY's, classic *"Your Novice Accent, And What to Do About It"* focused on some of the QRP operating practices observed at KI6SN during about 40 years as a low power enthusiast.

Keith's original article appeared in the November 1956 edition of QST magazine, giving Novice newcomers tips on avoiding the pitfalls and bad habits many newly licensed operators of the time were falling into.

Although written in a different millennium, last quarter's "Your QRP Accent" takes a different tack from 'DTY's treatise, focusing on some of the brass pounding traits I've observed around the popular low power watering holes.

An e-mail from **Paul Brenner, W6RLF,** of Ross, CA, caught the essence of what many of you had to say:
"Really enjoyed your article about the 'QRP Accent.'

"A lot of good tips. It caused me to go back and read the original 'Novice Accent' article also.

"On general operating practices, one I really have trouble with: Operators who run their (CW) characters together.

"Had a QSO - more or less - recently with a guy whose basic speed wasn't beyond my ability; but as I haven't made the transition to right-brained code copying, I need an instant to 'translate' the character.

"When someone runs the characters together, I don't have the chance. I'm not arguing for Farnsworth spacing - though it's nice. But a LITTLE spacing ain't bad!"

As Paul and others so astutely pointed out, often times a station's power output has little to do with whether or not QSOs are being made.

As a QRPer, if you're finding it challenging to make contacts on CW, the first place to check is at the end of your arm.

In the big scheme of things, if your letter formation and CW spacing is so poor as to be unintelligible, all the power and high gain antennas in the world aren't going to do you any good.

If you're unsure about the quality of your CW, ask for a candid on-air assessment from a fellow QRPer or other operator you trust.

When you're satisfied your fist isn't the issue, then it's time to look at antenna and feedline efficiencies, your transceiver or transmitter, or other elements of your station set-up.

But start with your fist. In many ways, it's easier to fix than sky wires or blown final transistors.

The bottom line is: If you've got a QRP accent and you want to do something about it, the power to change is fully in your hands - or fist, as the case may be.

A little power. A little patience. A lot of success

Ken Hoglund, KG4FGC, of Winston-Salem, NC, concedes that "OK, playing (one night recently) on 20 meters was not very good, but I did hear some DX ops.

"Of course, I heard the usual kilowatt pileups and tossed my small signal against them with no success. Actually I

overheard one guy complain he couldn't work U4MW because he was 'only' at 1,200 watts.

"Then came across a call I had tried to work earlier in the evening: TM0X EU032.

"I caught him asking for 'the QRP station.'

"After two tries he had it. Then 'was there another QRP station?'

"Again, two tries and he had another. Then much to my amazement, 'Any other QRP stations on frequency?'

"You bet there was - one try and we had a QSO. And that's with 3 watts out on my White Mountain 20 into the attic dipole, SSB no less.

"Nice ears, and even nicer protocol in fighting the pack.

"So the bands may be rough, but there are gentlemen and gentleladies out there, even among the QRO crowd.

"It was my only QSO of the night, but well worth it. Get on the air and fire some RF out - you never know who may be on the receiving end."

QRP success in the WPX

Todd Enders, AG0T, writes from Minot, ND, that in the recent WPX contest he "spent a total of 16.5 hours operating time, which netted 135 QSOs worth 220 QSO points and 105 prefixes, for a total of 23,100 points.

"A total of 31 DXCC countries worked, including the USA. I had 85 U.S. and 50 DX QSOs. Worked 10, 15, and 20 meters. Only luck on 10 was 6Y2A and KH6ND - the only two signals heard on the band at the time (Sunday afternoon). Both 15 and 20 were red hot Friday night. DX was everywhere, and anything I heard was usually quite obliging. I worked 9H0A in Malta.

"6Y2A on 15 meters was a one-shot bag, not even 3 hours into the contest. Propagation Saturday (was poor). Seemed the bands were open, but long enough that there wasn't much stateside heard, and DX coverage was spotty at best.

"Would work, say, a DL after a few tries, find another one,

louder than the first, and couldn't hit him for beans, even when he was calling CQ with no takers. Then there were the ones I could hear OK, but were also seemingly deaf to my signal. Real frustrating going, with the QSO rate average over 5 hours a paltry 6.8 / hour.

"Burned me out big-time and I crashed early rather than going back for another round. After mowing the lawn Sunday, I felt like getting back into it again, so I fired up the rig and sat down to somewhat better conditions. At least I found some stateside business this go round, which lifted my spirits, and even managed to snag a few more DX stations, though coverage continued to be real spotty.

"In hindsight, I wish I'd have found some time to work 40 meters. I was planning to do so Saturday, but my body had other ideas. I did drop down to 80 meters for a bit Friday night late, but my local noise level was about S9, and though I called a couple guys I could hear, they couldn't hear me.

"The setup was an FT-817 into a Johnson Matchbox, which fed a Butternut HF-2V 80/40m vertical.

"Being 3/4 wave, more or less, on 15 meters, that's where I spent most of my time, though it also plays quite well on 10 and 20 meters. Have now worked DX with this setup on every band between 40 and 10 meters with the exception of 12 meters.

"It DOES have its limits though, and I'd have likely had much better results on Saturday if I'd had a nice beam way up there.

"Someday when I get out of this apartment . . . Anyway, it was fun! Wish I'd had the chance to do more operating, but for the time I put in, I'm not displeased with the results."

QRPacificon 2002

by Doug Hendricks, KI6DS

I am really excited to announce the speakers for QRPacificon to be held October 19, 20 and 21 at the Sheraton Hotel in Concord, CA. We have a wonderful lineup of speakers, including Paul Harden, Jim Duffy, Dave Benson and the designers of the new NorCal transceiver kit on 30 meters, Dan Tayloe and Dave Fifield. We have a full slate of activities planned and hope that you can attend.

Friday: 6 - 7:30 No Host QRP Dinner @ Fuddruckers

7:30 - 12:00 NorCal Qrp Hospitality Room open featuring the RockMite Nite Building and Operating Contest

Saturday: 8 - 1:00 QRP Forum Speakers:

Dave Benson, Dave Fifield and Dan Tayloe, Paul Harden, Jim Duffy

1 - 5:00 Visit Vendors and Socialize

5:30 - 7:30 Dinner on your own. This is a great time to get a small group of your friends together and go out for a nice meal.

7:30 - 12:00 NorCal QRP Hospitality Room open Featuring: NorCal VXO Contest Judging and NorCal Building Contest Judging. Presentation of NorCal Distinguished Service Plaques to 3 Great NorCal QRPers, QRP Vendors, QRP Swap

VXO Building Contest Rules

We have decided, at the suggestion of Dan Tayloe, to have VXO Building Contest. This contest will be held on Saturday night, October 20th, at the NorCal QRP Hospitality room at the Sheraton Hotel in Concord, CA. The purpose is to see who can get the greatest frequency swing out of a VXO for 40 meters and 20 Meters. Here are the rules:

1. The entry must be a VXO, NOT a VFO, and it will be tested for Frequency Swing and Stability.
2. The entry must use the following parts: 1SV149 Varicap

diode, 78L08 voltage regulator, 2.1 mm power jack and 1 or more 7.040 NorCal Crystals for 40 meters and 1 or more 14.060 crystals for 20 meters.
3. Each VXO will have a 2.1 mm power jack for power.
4. We will test each VXO by plugging it in to a 12V power supply provided by us.
5. Each VXO must use a SIP socket for 1 crystal. (If you parallel more than 1 crystal, you only have to socket 1 crystal.) All entries will use the same Official NorCal Great VXO Contest Crystal (that is stored in a Mayonaise jar in my Radio Room under lock and key until the contest) during testing.
6. Only NorCal 7.040 crystals may be used in the 40 meter VXO. (No Mixing Schemes)
7. Only NorCal 14.060 crystals may be used in the 20 meter VXO. (No Mixing Schemes)
8. There is a parts kit available from NorCal. It contains the following:

1 x 7.040 Crystal
1 x 14.060 Crystal
2 x 1SV149 Diode
2 x 78L08 Voltage Regulators
2 x 2.1 mm power jack
2 x SIP .!" Header

To order the kit send $10 to Doug Hendricks. Make check or money order out to Doug Hendricks, not Norcal. Also, send $3 for each additional crystal ordered. Be sure to specify frequency.
Send your orders to:

Doug Hendricks
862 Frank Ave.
Dos Palos, CA 93620

9. All entries must have a schematic accompanying it.

10. We will have an overall division, (add the 2 swings together of the 20 and 40 meter VXO), and a 20 meter and a 40 meter division.
11. If you wish to enter the contest and will not be attending, it is up to you to make arrangements to have your circuit entered. Ask on the list, I am sure that plenty of guys will step forward and offer to receive your entry and make sure it gets to the contest and back to you.
12. No variable caps allowed.
13. VXO circuits are to be built separately, i.e. you will build two circuits, one for 40 meters and one for 20 meters.

Rock Mite Nite at QRPacificon

We will have a special operating and building contest on Friday night at Pacificon this year. Teams will build and operate Rock Mites on Friday night. More details to follow, but basically teams will be formed to build a Rock Mite in a predrilled case (made from PC Board instead of Altoids tins) that they will also have to build.
When they get the rig built and working in the case, they will then have to copy a code word from a station operating in the room, and send the code word back to the station. There will be 4 members per team.

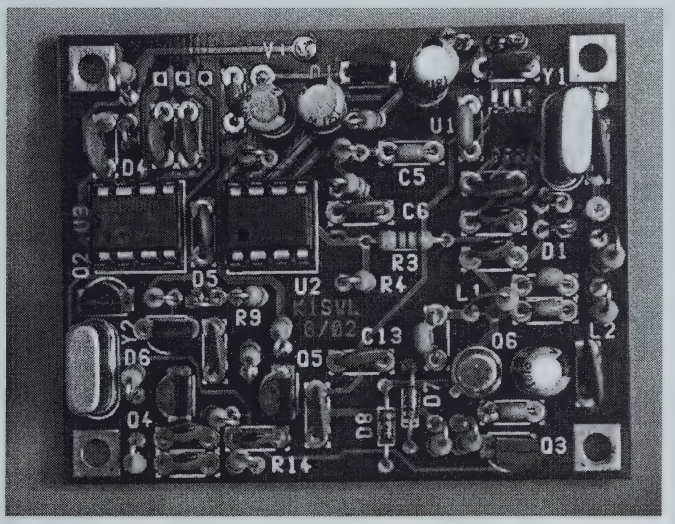
Teams will also have to supply their own antenna, and it has a restriction of 6', but can be pre built and brought to the event.

10 kits will be supplied by NorCal and Dave Benson, so we will have 10 teams in the event. Should be fun.

QRPacificon Building Contest

We will have our annual building contest again this year. Judges will determine the classes when they see the entries, and remember that it must have been built since last Pacificon and not entered in any other building contest.

The'Rock-Mite'
A simple CW transceiver for 40 meters!
by Dave Benson, K1SWL



The 'Rock-Mite' design grew out of my desire to offer a 'one-evening' CW transceiver kit which would be both affordable and easy to construct. It first appeared at 'Lobstercon' - a QRP gathering on the Maine coast- in early July, 2002, where it was provided to all attendees courtesy of Small Wonder Labs and the NorCal QRP club.

The Rock-Mite is a crystal-controlled direct-conversion transceiver operating on 7040 KHz, the North American 'watering-hole' for QRP activity. It has an 8-pin PIC microcontroller on-board which controls a T-R offset on key-down. A brief tap of a pushbutton control switch reverses the offset to yield a second operating frequency. Pushing and holding on the pushbutton activates the speed adjustment routine for the built-in Iambic keyer. If you'd rather use an external keyer or straight key, there's a 'drop-through' mode which allows use of an external keying source.

You'll note in the image above that the Rock-Mite uses two crystals. The first is used in the local oscillator for trans-

mitter and receiver. The second is used as a receiver front-end filter. This crystal significantly reduces the 7100-7150 khz SWBC energy present at the receiver mixer; as a result, unwanted SWBC reception is dramatically reduced.

The Rock-mite uses one surface-mount part with fairly large spacing. There are no toroids to wind, so assembly should be a snap! The Rock-Mite uses subminiature epoxy-encapsulated RF chokes instead of toroids- maximum harmonic content is -34 dBc.

SPECIFICATIONS:-

- Double-sided PCB 2.0" x 2.5", plated-thru-holes, solder masked & silkscreened for easy assembly
- 0.5W power output at 12V supply.
- Supply voltage range 8-15V
- Tuning: fix-tuned, two frequencies ~7039/7040 Khz
-automatic T/R offset, reversible
-Built-in Iambic keyer, 5-40 WPM
-Built in sidetone, 700 Hz
- Includes assembly instructions and operating tips
- All on-board parts supplied in kit (as pictured above)

AVAILABILITY:

The Rock-Mite is shipping now! Allow 2 weeks for delivery. *QRPproject (Berlin) will offer the Rock-mite with 7.030 Crystals! Click on our main page 'Deutsch' link for further information.*

PRICE:

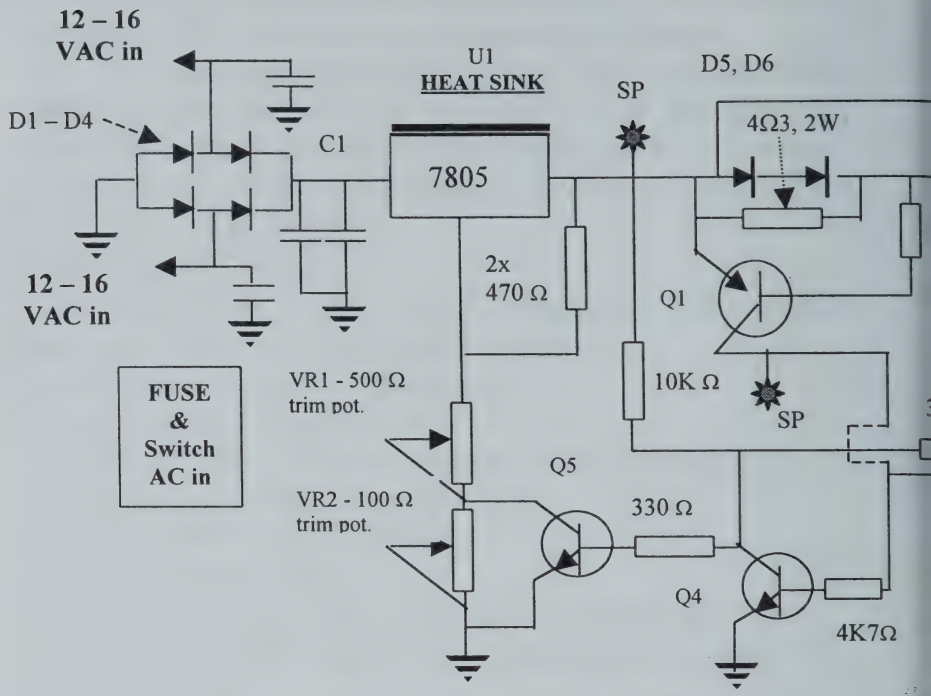
$25 (US/Can) includes shipping*

$28 (all others) includes airmail shipping*

** these include the 7.040 Mhz crystals. See 'QRPproject' for the European version. Other frequencies are not currently available.*

Please Note: There's no enclosure kit available for the Rock-Mite. It's 'Altoids-compatible', however, so a source of enclosures is probably as close as your nearest market or pharmacy!

To order send $25 US & Canada, $28 all others in US

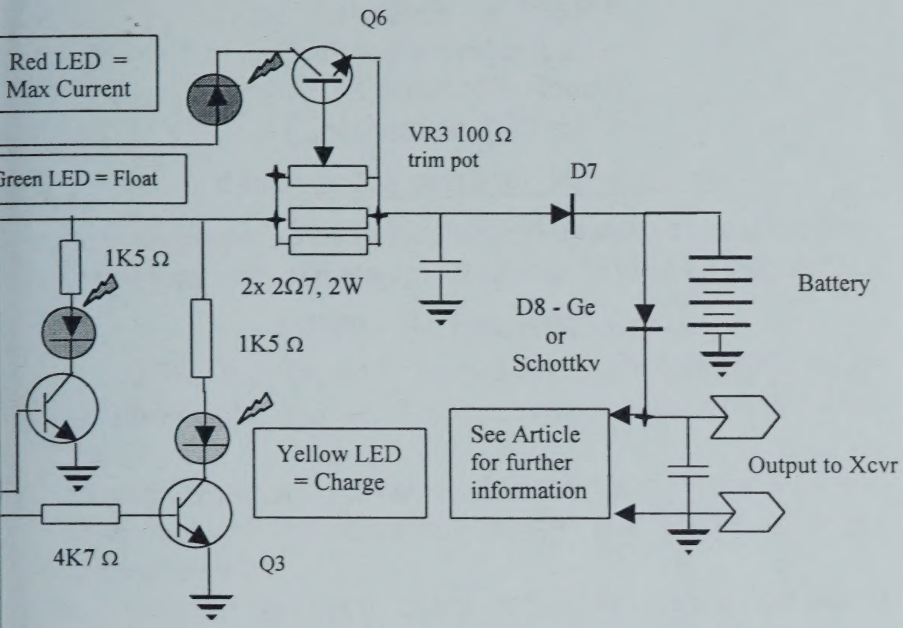


Parts Identification

C1 = 1000 mfd electrolytic
Cx = all unidentified capacitors = .1 mfd
D1 – D7 = 1 amp Si (1N4001 etc)
D8 = 2 amp rated, Ge, Schottky barrier diode (if used)
LED 1= Green for On/Float Red for Max Current
LED 2= Yellow for active Charge above 100 mA
LED 3= Red for Max Current as set (500 mA)
Resistor values as shown. All ¼ watt except where noted
VR1 = 500 Ω Trimpot
VR2, VR3 = 100 Ω Trimpot
Q1 = PNP 2N3906 or equivalent
Q2 – Q6 = NPN 2N3904 or equiv.
U1 = LM7805 – Heat Sink U1 ~ Important!

Simple Adjustments:

Step 1) Apply 12 –
Green LED only shou
Step 2) Short the two
terminals are shorted,
Step 3) Connect a D
load on circuit), adju
current level (or other
700 mA charging rate

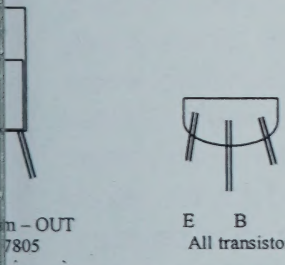


n NO battery attached to terminals,

.C power and, adjust VR2 for 13.6 Volts at battery terminals. The ighted.

rminals and adjust VR2 for 14.6 volts at battery terminals. When SP reen "Float" LED goes off and the Yellow "Charge" LED turns on.

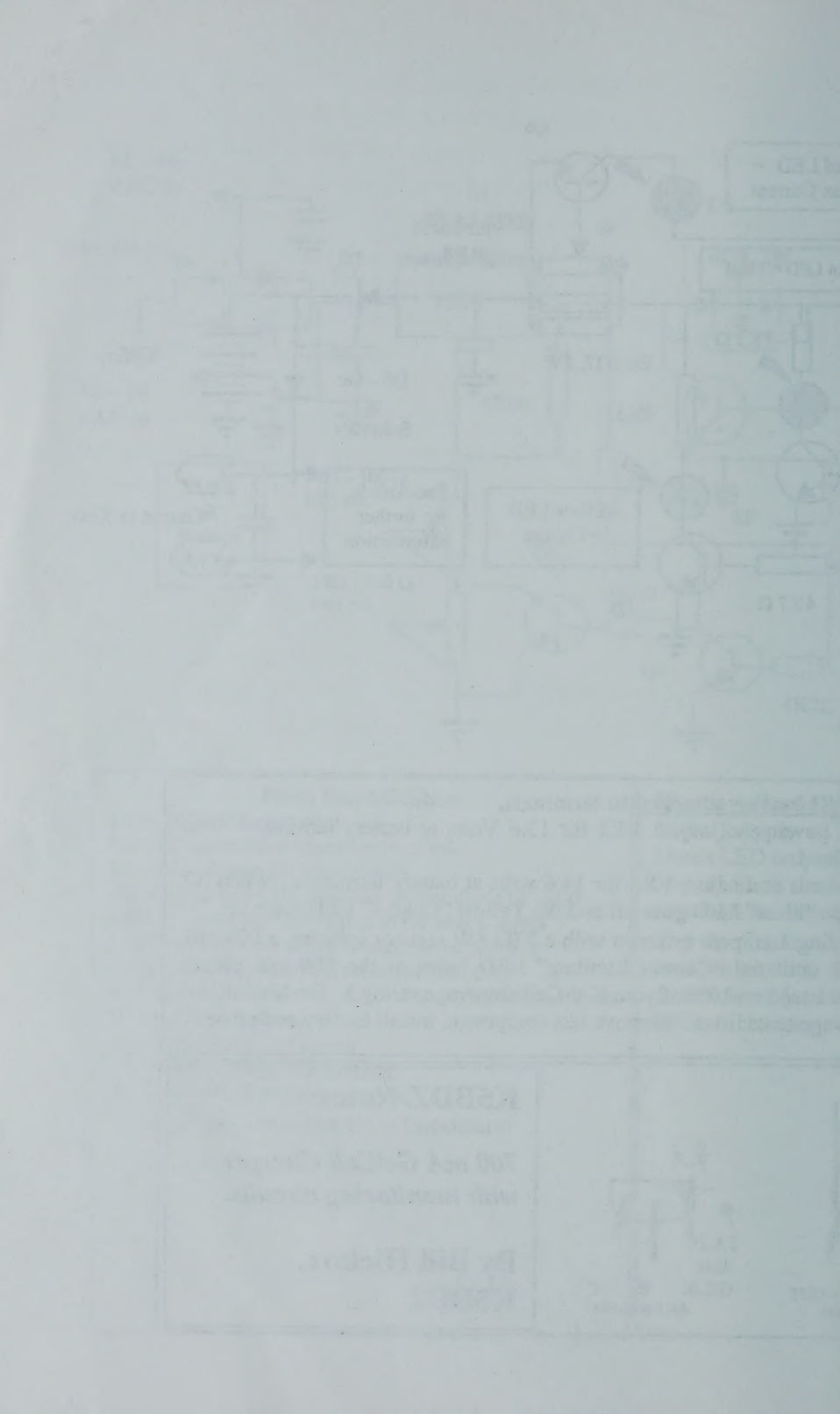
eading 1 ampere in series with a 27Ω 5W resistor (placing a 500 mA 1 until red "Current Limiting" LED lights at the 500 mA output ate based on 10% of your Gel Cell amperage rating.). Do Not exceed omponents listed. Remove test equipment, install battery and power.



K5BDZ Notes:

700 mA GelCell Charger with monitoring circuits.

By Bill Hickox, K5BDZ



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